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THE GENUS *DIOSCOREA* IN THE CAPE PROVINCE WEST OF EAST LONDON

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Abstract.

In this paper the distribution of the eight species of *Dioscorea* occurring in the most southerly part of South Africa is given. The persistence of the aerial shoot under natural conditions for more than one season is reported for the first time in the genus. Tubers are described and compared; particular reference is made to an interesting form of perennial tuber; a fundamental difference in the development of two forms of tubers as seen in the seedling stage is noted. The phylogeny of the species is discussed and a new section to include three species endemic to the area is suggested. A complete description accompanied by line drawings is given for each species. The species under consideration are *Dioscorea burchellii, D. cotinifolia, D. elephantipes, D. hemicrypta, D. mundtii, D. rupicola, D. stipulosa* and *D. sylvatica.*

Distribution.

The Cape Province west of East London and Queenstown has a temperate climate with rainfall varying from a summer maximum in the east to a winter maximum in the west as shown diagrammatically in Fig. 1. In the part of the Cape Province which lies to the east of East London both the climate and the flora are predominantly sub-tropical and hence this division is taken as a convenient geographical limit for dealing with the species of *Dioscorea.* By contrast the flora of the Western Cape is a well defined *fynbos* (*macchia*), while inland behind the coastal mountain ranges in the more arid regions, the Karoo Flora is dominant, giving place to the Grassland Flora on the inland plateaux where the rainfall is higher. Therefore in the area under consideration, that is west of a line drawn between East London and Queenstown, all four floral types are represented. In the transitional climatic region where they converge (the Eastern Cape Province), each contributes a rich quota of species and here aspect may be the leading factor in determining which predominates.

Of the eight species of *Dioscorea* known to occur west of East London four, *D. cotinifolia*, *D. mundtii*, *D. rupicola* and *D. sylvatica*, occur in communities of sub-tropical affinity, two, *D. burchellii* and *D. stipulosa* occur in fynbos and two, *D. elephantipes* and *D. hemicrypta* occur in Karroid communities. Their geographical distribution is shown in Fig. 1 and detailed ecological data and records are given subsequently under the relevant description for each species.

Observations which suggest that temperature and rainfall are important factors in controlling distribution were made in the case of *D. cotinifolia*. This species flourishes in the Transvaal and Natal but is at the southernmost end of its range in the area under consideration. It was collected in the Port Elizabeth Division in 1930 (Long 139, van Stadens), but this has not been confirmed in recent years, and the observations referred to were made at Port Alfred in the Bathurst Division, the next most southerly place where it has been recorded. During the period June, 1961 to February, 1965 when field observations were made, male inflorescences were regularly formed every season but they were never as abundant as in specimens from Komga in the subtropical region just east of East London, and female flowers were generally scarce at Port Alfred. After excessive rains in March 1963 male flowers were present in November-December, but the buds failed to open. They were well developed but withered away after about four weeks. Mean rainfall and temperature readings over the months October, November, December are given for four stations along the coast in Table 1.

TABLE 1.
October to December: Rainfall and Temperature

		Temperature °F		
	Mean Rainfall ins.	Difference Mean Max. Mean Min.	Abs. Max.	Abs. Min.
Port Elizabeth	6·00	12·6	107·0	43·0
Port Alfred	7·05	18·0	107·0	42·0
East London	9·82	13·6	104·0	42·0
Durban	14·98	11·2	99·6	75·2

It is suggested that the drop in temperature at night during early summer combined with lower rainfall is sufficient to inhibit proper opening of flowers.

In a sheltered inland valley about 15 miles distant from the Port Alfred coast, flowers were not abundant either but in the winter of 1961 a number of very young seedlings were found as well as juvenile plants with well developed tubers suggesting that this area was more favourable for the opening of flowers and the formation of seed.

The Aerial Shoot

Burkill states (1960) that it is a family characteristic of the Dioscoreaceae that the aerial stem is annually formed and replaced. He cites only two reported cases of persistent aerial stems, one is that of a new genus from Madagascar published in 1925 (Perrier de la Bâthie) and typified by the species *Avetra sempervirens*. It is described by Perrier de la Bâthie as having a persistent stem. The other record is by Human (1916) who gave an account of *Dioscorea multiflora* belonging to the section Sphaerantha, growing in cultivation in Buenos Aires, which he said had an evergreen stem. Burkill states, without evidence, that "there are strong reasons for holding that in these plants the stem does not continue active through a second year". In fact, of the eight species dealt with in this paper, three species, and possibly also two others, are known to have aerial stems which persist for at least two years. This can be made clear by following the development of the aerial shoot during the seasonal changes in a typical 'annual' species and comparing it with what happens in the 'perennial' species.

In *D. rupicola* a new shoot is formed from the tuber crown in October. Its growth is rapid and vigorous, flowers are present in November-December and capsules open to shed seeds in May. By this time leaf-fall has already started and by mid-winter (July) the vine is bare and lifeless, dying back completely before the annual renewal of the shoot *ab initio* from the tuber crown towards the end of spring.

In species with a 'persistent' aerial stem only the uppermost aerial parts are deciduous, the lower laterals and main stem remain dormant during the winter and some of the lower leaves also remain green during this period. When the growing season starts new shoots are produced from axillary buds either on the main stem or lower laterals. Aerial stems persisting for more than one season and giving rise to the new season's growth in this way have been observed in *D. cotinifolia* and *D. sylvatica*, where the growing season starts in August-September; and in *D. mundtii*, an autumn flowering species in which the growing season starts in January and which is confined to the George and Knysna Divisions. Stems showing this form of regeneration are shown in Figs. 2, 7 and 10 and specimens have been distributed to certain herbaria. In *D. cotinifoial*, *D. sylvatica* and *D. mundtii* even young plants which are not sufficiently mature

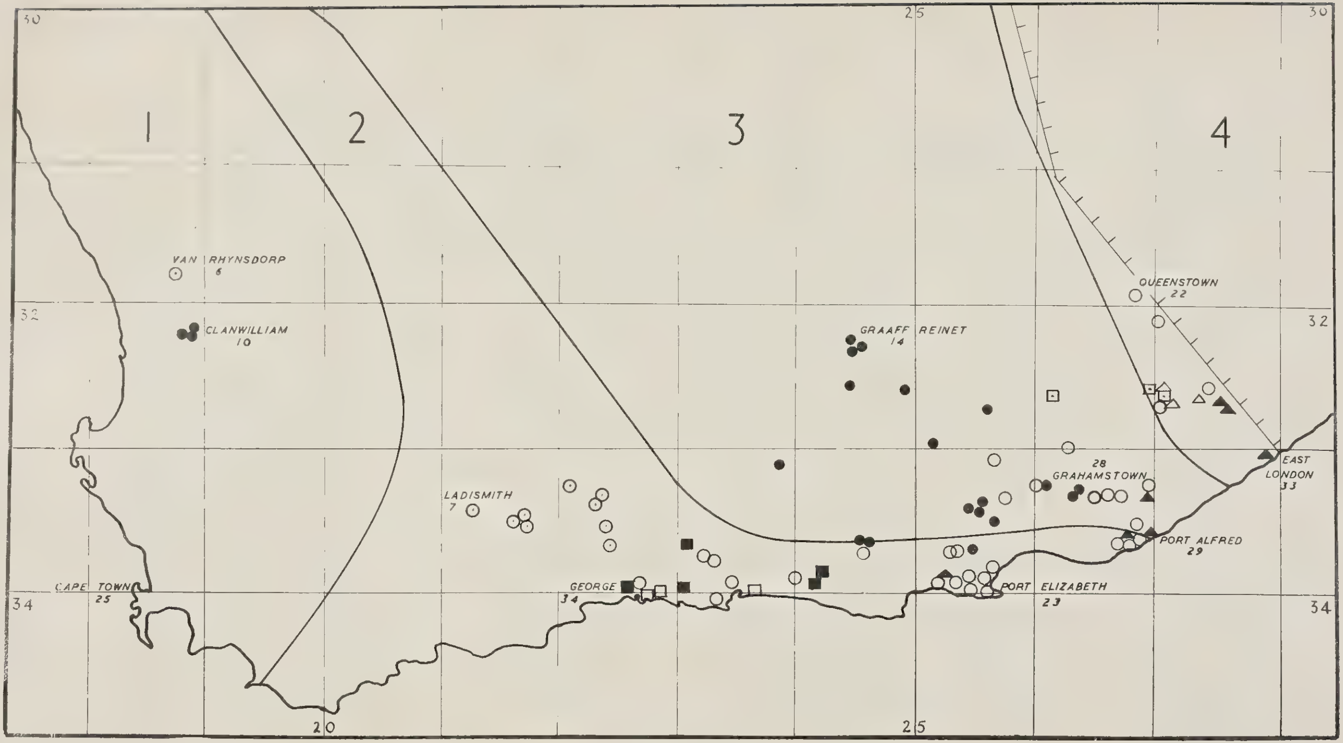


FIG. 1.

Map of Cape Province west of East London and Queenstown showing seasonal rainfall zones (after T. E. W. Schumann) and distribution of eight species of *Dioscorea*. Rainfall areas: 1. Winter; 2. All-season; 3. Summer (max. in March); 4. Summer (max. in January to March). Average annual rainfall in inches is given next to the places named.

▲ *D. cotinifolia*
○ *D. sylvatica*
● *D. elephantipes*
⊙ *D. hemicrypta*
△ *D. rupicola*
□ *D. mundtii*
■ *D. burchellii*
⊡ *D. stipulosa*

to flower show this persistence of the aerial stem and regeneration from primary or secondary axillary buds.

It is not known how long the main stem persists. In *D. cotinifolia* specimens under observation which produced a new main shoot from the tuber in 1963, produced laterals from aerial buds in 1964 and again in 1965. In *D. sylvatica* aerial shoots collected in the fields show on the main stem the stumpy remains of previous aerial branches for at least two and possibly for five previous periods of growth. In the case of *D. burchellii*, a rare autumn flowering species occurring in the tall fynbos of the George Division, plants could not be kept under regular observation. However vines marked in May 1963 were still in leaf when seen in April 1964. There is also reason to believe from evidence of dead branches and axillary growth that both this species and *D. stipulosa* do not die back completely each year.

Should the main stem be injured or removed a new stem is formed from the tuber crown at the appropriate growing season. In nature there is generally only one main stem per tuber, but the remains of one or more dead main stems are generally still attached to the crown. Very rarely in *D. cotinifolia* and *D. sylvatica* have two functional stems been found on the same tuber.

It is significant that persistent stems and renewal of growth from aerial buds occur not only in *D. mundtii* and possibly *D. burchellii* and *D. stipulosa* which are endemic to this temperate region, but also in *D. cotinifolia* and *D. sylvatica* which have a wider distribution. If the latter species behave similarly in the sub-tropical region it would seem that persistent stems might be of more widespread occurrence in other species of *Dioscorea* and have not been reported through lack of observation.

Tubers

For lack of exact knowledge of the undergound parts of many species it has generally been accepted that annual tubers are most common in the genus *Dioscorea* and that the solitary perennial tuber is rather exceptional. Of the eight species described here none have distinctly annual tubers and seven have a solitary perennial tuber. In the exceptional case, *D. cotinifolia*, there are a number of tubers which are formed singly at the ends of horizontal roots which arise from a perennial crown. This is apparently similar to the tuber system in *D. esculenta*, an edible Asian species of the Combilium section, now widespread in many parts of the world and to the system in the species of two other sections, Madagascariensis and Cardiocapsa, endemic to Madagascar. However all these species are said to have tubers which are replaced annually, whereas in *D. cotinifolia* tuber development does not seem to be completed within the year; for example in August there are present mature tubers up to 5 cm diameter, juvenile tubers about 2 cm diameter and newly developing tuber-bearing roots which are just beginning to elongate but have not yet any swelling at their tips.

There is a fundamental difference also in the development of the seedling of the many tubered species as compared with those that have a solitary perennial tuber. In the seedling of *D. cotinifolia* the first tuber is a small swelling which is formed *laterally* with respect to the base of the first leaf (fig. 2). The leaf-base, presumably the hypocotyl/epicotyl region, forms the crown which in turn gives rise to horizontal roots, each terminating in a tuber. The development of the seedling in a species producing a solitary perennial tuber has been fully described by Sparshott (1935) who made a detailed study of *D. elephantipes*. Here the tuber is formed from the hypocotyl and in the seedling shows first as a small swelling immediately *below* the base of the leaf. Presumably the same type of seedling occurs in *D. hemicrypta*, another species with an epigeal perennial tuber and so similar to *D. elephantipes* as to be eligible for varietal rank. In *D. sylvatica*, the only other species in the section *Testudinaria*, the tuber is also developed immediately below the first leaf of the seedling (fig. 11).

It may be noted here that the final shape of the adult tuber in *D. sylvatica* is very dependent on the physical conditions of the soil. In loam it is uniformly disc-shaped with a few basal indentations and the growing point is below soil level. On scree slopes it may be subterranean, smooth skinned and variously misshapen by pressure agains rocks. In shallow soils the tuber may be partially exposed and tessellated above and with irregular lobes in the lower section below soil level. In dune sand it is subterranean and may become enormous, up to a metre across, like a thick pancake with irregularly bifurcating lobes (fig. 10).

In the remaining species the tuber is subterranean, solitary and perennial and of an interesting branched form which does not appear to have been previously noted. Seedlings of *D. rupicola* and *D. mundtii* have been examined (figs. 4, 6) and the tuber appears as a small pyriform swelling immediately below the first leaf. It is remarkably similar at this stage to that of *D. sylvatica* and presumably is also developed from the hypocotyl. The upper part persists as a vertical crown and from the base one or two finger-like out-growths appear which produce a narrow, long-lived, sparsely branched tuber, covered by cork, increasing gradually over its whole periphery in thickness and elongating by apical growth. The vertical crown never comes above ground, in fact it is generally 9–10 cm below soil level in well developed plants, although elongating gradually from the apex which produces only one aerial stem at a time. The tubers of *D. burchellii* and *D. stipulosa* are essentially similar although smaller, with a much thinner layer of cork and generally more branched. Presumably the tubers of these two species are also developed from the hypocotyl. It may

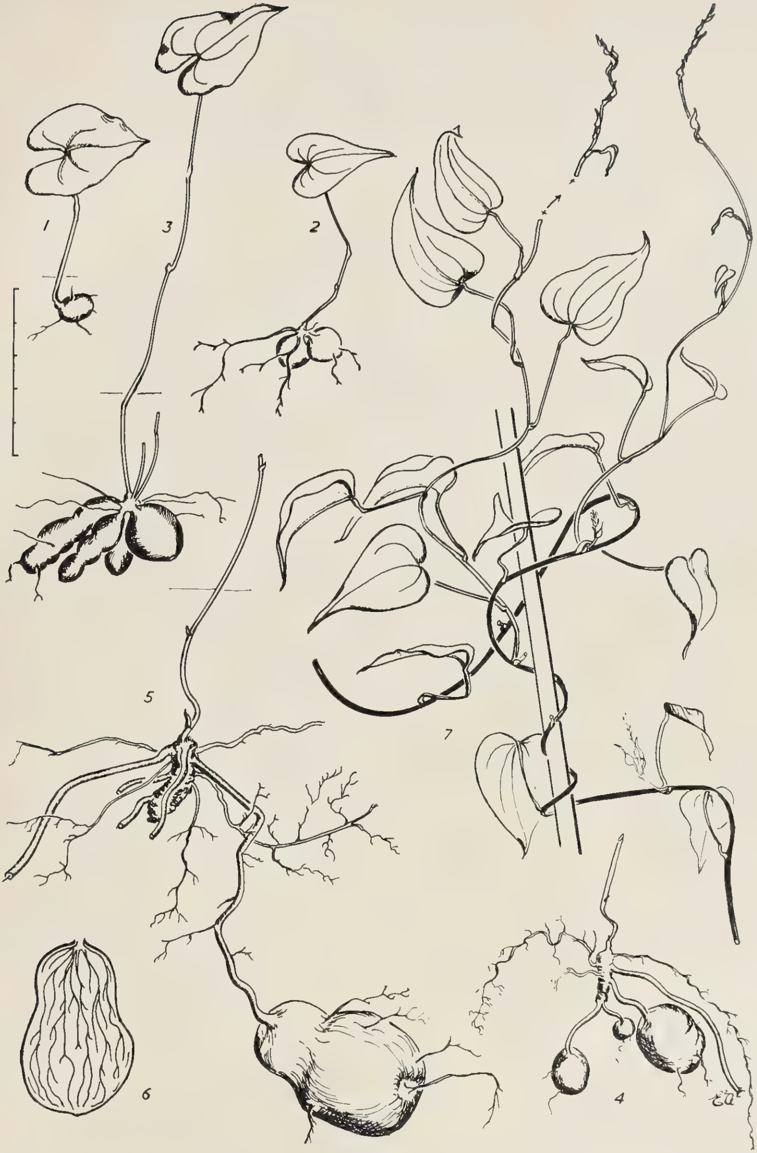


FIG. 2.

D. cotinifolia. 1—5 stages in development from seedling to young adult plant; 6 longitudinal section tuber; 7 renewal of growth in September from aerial stem of previous season (perennating stem shown in black). Scale = 50 mm.

be noted that in respect of *D. burchellii*, *D. mundtii*, *D. rupicola*, and *D. stipulosa* Burkill's key to the Old World sections of the genus breaks down as the tubers are perennial and the aerial shoot generally has more than three internodes buried between the crown and the soil surface.

Phylogeny

The genus *Dioscorea* is a very large one with, according to Knuth (1924), over 600 species. Burkill is of the opinion that it is of tropical Indo-Chinese origin and that it had spread through Africa and was established in the southernmost regions prior to the Cretaceous splitting of the continents by the Atlantic Rift. This would have allowed species to reach South America both by migration from Northern Asia via North America and by separation from the African continent. At present it is not known whether the greater number of species occurs in Africa or in South America, each of which have more than the combined number of species in other parts of the world.

Burkill suggests that the earliest *Dioscoreas* showed sex separation with very little differentiation of the flower; they had twining stems, long-petioled gland-tipped leaves with a broad lamina and arcuate primary veins with reticulate intermediate venation; dispersal was by winged seeds released from a parchmenty capsule. It appears that most species in high tropical forests have the seed completely surrounded by the wing or bilateral wings that are equally developed on either side of the seed, the former being considered the more primitive. Probably very early in the evolution of species more suited to sub-tropical conditions, there was a change in the form of the seed wing. At the present day many sub-tropical species have seeds winged only at one end, described here as proximally or distally winged according to whether the wing is directed towards the basal (proximal) or apical (distal) end of the capsule.

It is generally agreed that wing-type is a valid character by which sections within the genus can be distinguished and takes precedence over foliar and floral characters. To assist the subsequent discussion a diagrammatic comparison of wing-type for the relevant sections is given in Table II. The purpose of the discussion is to draw attention to the primitive or advanced characters of the eight species under consideration and to see if it is possible to place them in any phylogenetic relationship. At the same time it is proposed to examine the status of the solitary perennial tuber and to indicate, in spite of the meagre evidence available, that it is probably of very ancient origin. To begin with species occurring in fynbos or karoo vegetation will be excluded as being of more recent origin.

The most primitive form of wing-type in the eight species considered here is found in *D. rupicola* which has bilaterally winged seeds. This species occurs in the high forest of the Amatola Mountains at the limit of the mid-summer

Table 2.
Diagrammatic comparison of some seed-wing and tuber characters in the genus *Dioscorea*.

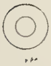
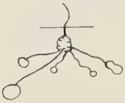
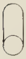
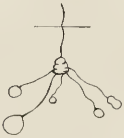
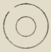
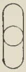
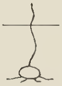
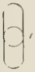
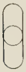
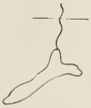
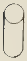
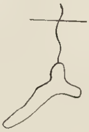
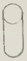
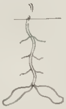
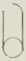
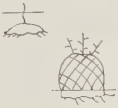
Wing	Tuber		Section	Species	Origin
		annual	Combilium Madagascariensis Cardiocapsa	D. esculenta D. mamillata D. proteiformis	cultivated Madagascar Madagascar
		? biennial	Cotinifoliae	D. cotinifolia	S. Africa
	?	armoured, ?solitary, ?perennial	Enantiophyllum (African spp.) Lychnostemnon	D. rotundata D. ceratandra	Sierra Leone Brazil
		solitary, ?perennial	Polyneuron	D. cyphocarpa D. minima	Mexico Mexico
	?	armoured, solitary, perennial.	Macroura	D. sansibarensis	Equatorial Africa
		solitary, perennial.	Rhacodophyllum	D. rupicola	S. Africa
		solitary, perennial.	Perennia	D. mundtii D. burchellii D. stipulosa	S. Africa

Table 2 (cont.)

Wing	Tuber		Section	Species	Origin
		annual	Brachyandra	D. nako D. antaly	Madagascar
		armoured, solitary, perennial	Testudinaria	D. sylvatica D. elephantipes D. hemicrypta	S. Africa

rainfall region. This is the most southerly point of its distribution, but it is not uncommon in Pondoland and Natal where other members of the South African section Rhacodophyllum are to be found. It has long petioles and very large lobed leaves with a conspicuous drip-tip; taken with the wing-type, this leads me to believe that it is the most primitive species in the area. It may be compared with *D. mundtii*, which is also a forest species but occurs in the all-season rainfall zone. On leaf characters the latter would appear to be more primitive than *D. rupicola* but the seed wing is very definitely proximal and on this basis it must be accepted as belonging to a different and probably more recent phylum than *D. rupicola*. In the case of *D. sylvatica* and *D. cotinifolia* the seed is distally winged. This indicates on wing structure alone that at least three ancient lines of development have been established in the area.

Let us turn now to consider how the form of the tuber affects the argument. It has already been shown above from the development of the seedling that there are two basically different modes of origin of the tuber. This immediately removes *D. cotinifolia*, with tubers of lateral origin, into a separate phylum from *D. sylvatica*, which has tubers of hypocotylar origin. Consequently it will be agreed that there are in fact four distinct phyla in the area.

To show that the two forms of tuber may be of very ancient lineage it is necessary to refer to species in other parts of the world, when it will be seen that these forms occur in species having the most primitive type of seed i.e. having the seed completely surrounded by the wing. Considering first tubers of lateral origin and referring to Table II, three species are given, *D. esculenta*, *D. mamillata* and *D. proteïformis* having tubers of this form. They belong to three different sections each of which is characterised by having the most primitive type of seed completely surrounded by the wing. Whether the tubers are annual, biennial or perennial would be an independent later development, quite possible with this lateral type of origin, and capable of alteration in the evolution of new species. The laterally developed tubers then may well have originated prior to the development of the distally winged seed.

In the case of the solitary perennial tuber of hypocotylar origin it has been shown that the tubers of *D. rupicola*, *D. mundtii* and *D. sylvatica* originate in this way. Difference in shape is again a plastic character capable of alteration in the process of more recent selection. It was previously noted that on wing-type these three species belonged to three distinct phyla. Therefore it would seem that in having a tuber of similar origin, the type of tuber was initiated in the genus *before* the wing character started to change. If this is so species with the most primitive form of wing might also have tubers of hypocotylar origin. Unfortunately no relevant studies of germination are available to confirm this but it is permissible to prophesy that in species having a single perennial tuber it will eventually be found that the tuber is of hypocotylar origin. No clear picture of the presence of solitary perennial tubers in the genus has yet been published as the underground parts of many African and South American species are not known. Certain deductions can, however, be made. Burkill (1952) quotes African species of the section Enantiophyllum, the tropical African section Macroura and the South American sections Lychnostemnon and Polyneuron as having armoured tubers. Presumably this means that they are perennial and being solitary that they are very probably of hypocotylar origin. In *D. minima* (sect. Polyneuron) the form of the tuber as figured by Knuth (fig. 52 A, 1924) is very similar to that of a juvenile plant of *D. sylvatica*. In the section Macroura the seed wing is bilateral and in the other three sections it is circular. If indeed the tubers in these sections is solitary and perennial and of hypocotylar origin, being associated with the most primitive wing-type it must have been evolved very early in the history of the genus. It also seems probable that the solitary perennial tuber was present in the southernmost part of the African continent in pre-Cretaceous times and had reached the South American continent prior to the Atlantic Rift.

The evidence given here is very slender and needs to be supported by anatomical investigation and a much wider comparison of the underground parts of different species. It does indicate however that the solitary perennial tuber may not have arisen from a rhizome according to Burkill's theory (1960 p. 346) and that De Bary's view (1877) that the Dioscoreaceae have three kinds of storage organs, namely swollen roots, rhizomes and tubers, is still tenable.

Turning now to speciation within the area under consideration it will be noted from the distribution records quoted for each species that five out of the eight are endemic to the area. In the section Testudinaria, with distally winged seeds, *D. elephantipes* and *D. hemicrypta* are definitely denizens of the Karoo Flora. They are adapted to shallow soil in a semi-arid climate by having a perennial epigeal tuber which is well protected by thick cork and by the spiny remains of old shoots. Several growing points give rise to more than one shoot per season and have the ability to remain dormant in drought and to react quickly to unusual rains. The small glaucous leaves which fold upward about the mid-veins on hot days are deciduous in drought. The persistence of a remarkably well developed drip-tip is a feature worthy of future investigation. The development of these two species from the more widely distributed *D. sylvatica* is obvious, particularly in view of the highly plastic nature of the tuber in the latter species; subterranean with thin smooth skin in deep soils and partially exposed with corky tessellations on upper surface in shallow stony soils. Presumably *D. elephantipes* and *D. hemicrypta* have evolved comparatively recently within the Eastern Cape region and since the development of arid conditions during Pleistocene times.

The other three endemic species *D. mundtii*, *D. burchellii* and *D. stipulosa* agree in having proximally winged seeds, solitary perennial tubers of branched form, simple leaves, spike-like male inflorescences, globular buds, small receptacles, rotate flowers and six stamens. It has not been possible to place these species in any of the sections in Burkill's key to the Old World sections of the genus *Dioscorea* (1960), because their tubers are perennial, which, according to Burkill, would place them in the sections Borderea, Testudinaria or Macroura. This is quite incorrect as they have proximally winged seeds and many other contrary features. According to Knuth (1924) they are placed in the subsection Isocantha of the section Opsophyton, in which he includes such a manifestly different plant as *D. cotinifolia* and other unrelated species. Part of this confusion arises from the fact that the tubers of these species were hitherto unknown and such characters as left twining stems, simple alternate leaves and a spike-like male inflorescence with male flowers carrying six stamens were used in their assignation to sections.

I prefer to compare these three species with Burkill's Madagascan section Brachyandra (Burkill and Perrier de la Bâthie, 1950) in which the seeds are proximally winged, the buds globular, the perianth open (rotate or sub-rotate) and the stamens not grouped densely at the base of the flower. Indeed the leaves of *D. stipulosa* and *D. nako* are very similar while being unusual in the genus as a whole. But in the Brachyandra there are two tubers which are renewed annually from the lower part of a perennial corm. I consider that the presence of the solitary perennial tuber far outweighs the similarity of floral characters and also the presence of more superficial characters such as petaloid

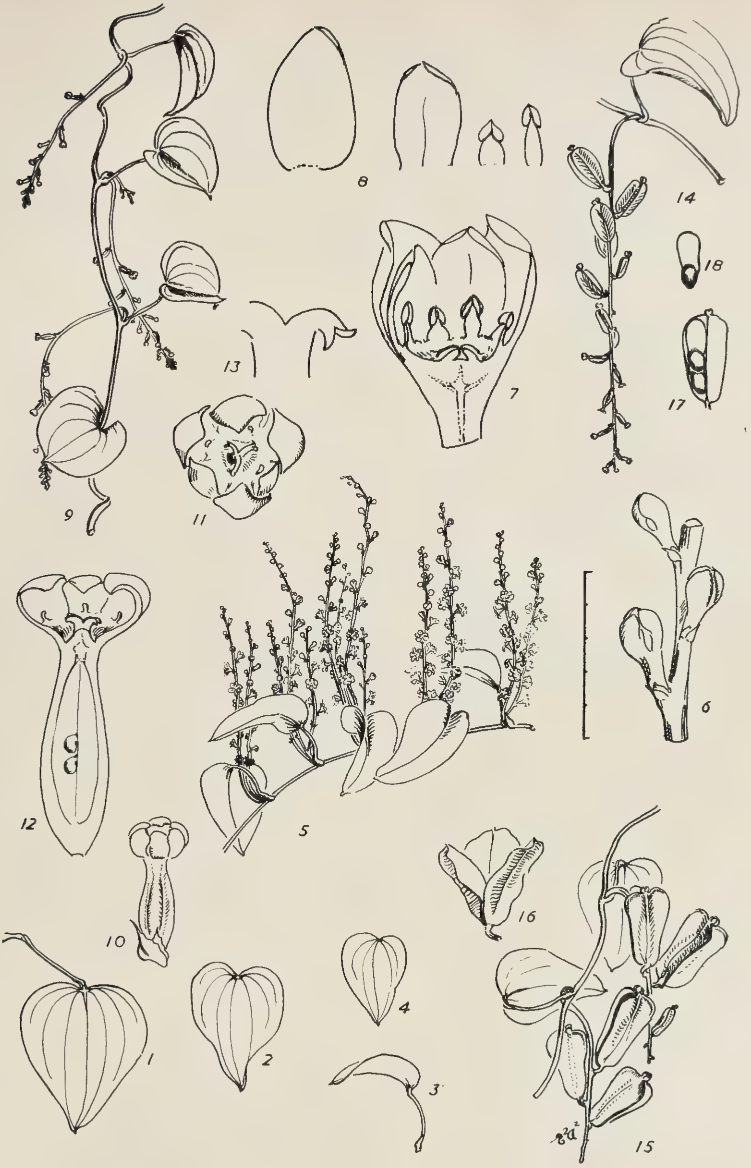


FIG. 3.

D. continifolia 1—4 leaves from: main stem 4 ft. above ground, lateral just below canopy, mass of foliage in canopy (surface and side views); Male plant: 5 inflorescences, 6 buds, 7 longitudinal section flower, 8 dissection flower; Female plant: 9 inflorescences, 10 open flower, 11, 12 flower surface and sectional views, 13 branch of style; 14—16 stages in development of fruit; 17 longitudinal section capsule; 18 seed. Scale = 50 mm fig. 1—5, 9, 14—18; scale = 5 mm fig. 6, 10; scale = 2·5 mm fig. 7, 8, 12; scale = 1 mmfi g. 13.

inclusions (cf *D. burchellii* and *D. acuminata*) or stipules and simple tubercles (cf *D. stipulosa* and *D. antaly*). I prefer to regard these three species as forming a separate section *Perennia* whose relationship with other African sections will be clarified when underground parts come to be better known and which, by virture of its unusual geographical position, will probably be found to have a parallel development on the South American continent.

Within the group Perennia itself *D. mundtii* is obviously the most primitive species, having for example broad long-petioled leaves and flourishing in a forest margin environment. I consider it a relic species which may have some affinities with South American species. *D. burchellii* occurring in typical high growing Western Cape fynbos, which is a competitive community to forest in this area. is not a vigorous species. Its tubers are not well armoured and are liable to be eaten by tunnelling predators; female flowers are rare and fruit has so far not been recorded. Because of its great similarity to *D. stipulosa* in many other respects it is safe to assume that this species has proximally winged seeds. The few localities where *D. burchellii* has been reported are areas where afforestation with timber-producing pine trees is one of the main forms of land use and as it does not survive under these conditions it is now in danger of extinction through human activity. It may be regarded as one of the notable species evolved comparatively recently since Western Province fynbos has moved eastward into the transitional area of the Eastern Cape Province.

D. stipulosa is a plant of more vigorous growth than *D. burchellii*, the latter being distinguished by the scarcity of lateral branches, pendant male flowers, petaloid inclusions and paucity of stipules and tubercles. *D. stipulosa* grows in the drier less luxuriant fynbos of the summer rainfall area, at altitudes 4,000 ft. higher than *D. burchellii* and in communities where there are also present representatives of northern genera such as *Melianthus comosus* and *Leucosidea sericea*. It is a species which seems to be moving northwards to higher altitudes and for this reason might be considered as a more recent variation of *D. burchellii*. Nowhere common, it is also a species that might be easily overwhelmed if the mountain land where it occurs should be developed for intensive high altitude grazing.

From this brief study of eight species in the highly interesting transitional area west of East London, it emerges that the ancient genus Dioscorea of north-eastern origin is here represented by four distinct sections, two of which together contain five endemic species. Solitary perennial tubers, generally regarded as being poorly represented in the genus are here predominant. For the first time the natural occurrence of perennial or at least biennial stems giving rise to the new season's growth by means of dormant aerial buds is reported for the genus and is shown in the species *D. cotinifolia*, *D. sylvatica*, *D. mundtii*, *D. stipulosa* and possibly also occurs in *D. burchellii.*

KEY TO SECTIONS AND SPECIES.

1.	Tubers several on roots from a perennial crown, stems dextrorse, seeds distally winged	*D. cotinifolia* (Sect. Cotinifoliae)
	Tubers solitary, stems syntrorse	2.
2.	Seeds bilaterally winged, leaf margins undulating, stamens three	*D. rupicola* (Sect. Rhacodophyllum
	Seeds not bilaterally winged, leaf margins not undulating, stamens six	3.
3.	Seeds proximally winged, tuber with vertical crown and 1—3 basal branches, stems up to 2 mm diam. not tapering	4. (Sect. Perennia)
	Seeds distally winged, tuber bunshaped, base entire or with bifurcating lobes, stem at base up to 20 mm diam. tapering	6. (Sect. Testudinaria)
4.	Stems ribbed, tuberculate	5.
	Stems not ribbed, glabrous	*D. mundtii*
5.	Male inflorescence pendant, leaves rarely with stipules	*D. burchellii*
	Male inflorescence erect, leaves stipulate	*D. stipulosa*
6.	Stems branching at right angles, rigid, only twining in uppermost parts	7.
	Stems not branching at right angles, lax, twining throughout length	*D. sylvatica*
7.	Tuber with conspicuous lobes at base	*D. hemicrypta*
	Tuber without conspicuous lobes at base	*D. elephantipes*

Dioscorea cotinifolia K. S. Kunth, Enum. pl. V, 386 (1850); R. Knuth, Pflanzenreich 87, IV. 43, 93 (1924) fig. 20 A–G; *D. malifolia*, Baker, Journ. Bot. XXVII, 1 (1889); Fl. Cap. VI, 248 (1896–97). Fig. 2 and 3.

Plants dioecious, upper leafy parts dying back seasonally and being renewed either from an axillary bud on the lower part of the aerial stem or *ab initio* from the perennial crown.

Crown and Tubers. In very young seedlings with a single leaf the hypocotyl epicotyl region is a small nodular swelling about 2 mm thick. This is the juvenile crown and gives rise to a laterally placed tuber up to 10 mm diam. The crown increases vertically by nodal growth giving forth fine branched rootlets, and thicker roots which terminate in a single tuber. Juvenile plants (with a shoot up to about 15 cm) bear up to 4 thick roots from 2–8 cm long, 2 mm diam, each terminating in a tuber 10–20 mm diam; tubers persist for more than one season; a few remains of old tuber-bearing roots persist attached to crown. Adult plants: crown about 3 cm below soil level, vertical, about 6 cm long, 1·5 cm diam, light creamy brown, gnarled; fibrous roots about 1 mm thick, wiry; tuber-bearing roots 4–6, up to 100 cm long, 1 cm or less diam, each terminating in a tuber; tubers globular or ellipsoidal, up to 9 cm long, 5 cm diam, outer skin light creamy brown, finely reticulate, soft, corky, without "eyes", inner flesh white, somewhat translucent, penetrated by numerous branching longitudinal opaque veins.

Stem solitary (very occasionally two), climbing, dextrorse, becoming much branched above in surrounding canopy at 3–4 metres, main stem and lower laterals may last more than one season, upper parts deciduous, growth commencing September either from axillary buds on aerial stem or from crown, lower parts with internodes up to 7 cm long, 2 mm diam, glabrous, wiry, brown or liver-coloured, bracts deltoid, about 2 mm long, apex subulate, leaves few; upper parts green, lax, creeping or pendant.

Leaves exstipulate, alternate, sometimes opposite, glabrous, deciduous, lower spreading, upper (in canopy) generally secund; lower pulvinus up to 7 mm long, about 1 mm diam, reddish-brown; petiole up to 25 mm long, less than 1 mm diam, olive-green, slightly channelled above, rounded below; upper pulvinus reddish-brown up to 5 mm long, scarcely thicker than petiole; lamina of juvenile leaves up to 4·5 cm long, 2·5 cm broad, deeply cordate, broadly ovate, sharply acuminate, acute; lamina of leaves from shaded lower part of adult plant up to 4·5 cm long, 3·7 cm broad, generally 7-veined, rounded or slightly cordate at base, broadly ovate, acuminate, obtuse, slightly mucronate; lamina of leaves from canopy spreading at right angles to incident light, folding upwards about mid-vein in great heat or drought, about 2·5 cm long, 2 cm broad, similar in shape to lower lamina, upper surface light yellowish-green, slightly glossy, veins and margins yellower, lower surface paler, matt, with concolorous veins.

Male Flowers. Inflorescences appearing October–December, racemes flexuous, erect, single or in axillary fascicles, rachis up to 14 cm long, pale green; flowers numerous, erect, solitary or in pairs; pedicels 1·5 mm or less; bract and bracteole deltoid, about $\frac{1}{2}$—$\frac{1}{3}$ length of pedicel, concolorous; buds obovate; perianth white, cup-shaped, about 5 mm diam; segments about 2 mm long, joined in lower quarter forming a shallow cup, outer spreading, slightly concave, obovate, obtuse, inner slightly more erect, oblong; stamens 6, inserted at base of segments, filaments less than half length of segments, white, incurved, anthers basifixed, introrse, pollen yellow; style a rudimentary, tripartite swelling from floor of receptacle.

Female Flowers. Inflorescence solitary, pendant, spike-like, hidden by leaves, rachis up to 10 cm long, green, elongating as fruit ripens; flowers up to 16, almost sessile, pendant; bract and bracteole ovate, acuminate, acute, slightly dentate, bract $\frac{1}{2}$—$\frac{1}{3}$ length ovary, bracteole shorter; buds globular; perianth greenish-white, cup-shaped, about 2 mm diam; segments about 1 mm long, equal, erect, incurved at tip, joined at base for about one third of length, broadly ovate, obtuse, concave; filaments rudimentary, less than 0·5 mm long, attached to lower third of segments, anthers wanting; style cylindrical, about 0·5 mm long, 0·5 mm diam, style branches 3, spreading at right angles to style, apices decurved, acuminate, bi-lobed; ovary inferior, about 4 mm long, 1 mm diam, green, glabrous, longitudinally 3-ribbed, ribs rounded.

Fruit. Rachis remains pendant, pedicel thickens and elongates to about 2 mm, turning upwards bearing developing capsule erect; ripe capsule trilocular, three-winged, in side view turbinate terminating in globular remains of persistent perianth, up to 3 cm long, 2 cm broad at top, dehiscing from centre along ventral suture for about two-thirds of length, glabrous, light golden-brown with darker margins, ripening about July.

Seeds. 2 in each loculus, irregularly disc-shaped, dark russet-brown; wing distal, up to 14 mm long, 10 mm broad, russet-brown, membranous, rigid.

Habitat. Well represented in eastern coastal bush associated with *Schotia afra* and *Sideroxylon inerme;* becoming rarer westward and reaching its most westerly localities in the Bathurst Division at altitudes of about 50 ft. Also present in river bank bush with *Euphorbia triangularis* and in moister localities in low temperate forest at altitudes of 500 ft. Once recorded in such a locality in the Port Elizabeth Division. In Bathurst Division occurring in the same communities as *D. sylvatica*, in sandy loam over Bokkeveld Shale. The tubers are eaten by Bantu people in the Bathurst Division.

Distribution: TYPE, Cape Province, Kaffraria, Drege 4,500 (K) (probably between Bashee and St. John's River if sequence of numbers are a guide to locality).

CAPE PROVINCE. Port Elizabeth Division, van Stadens, Long 139 (AM); Bathurst Division, Port Alfred, Rogers no number 19/10/08 (AM), L. Britten 5111 (AM), Archibald no number 7/3/62, 7575 (AM, K, N), Rangemore Farm, Archibald 7535, 7536, 7537, 7538, 7539, 7540, 7546 (AM, K, N); King Williams Town Division, Acocks 12559 (N), Kei Road, Comins 1415 (AM); Komga Division, Schlechter 179 (AM), Flanagan 97 (AM); East London Division, Rattray 198 (AM), Nahoon, Smith 3735 (N), Need's Camp, Galpin 7100 (N). Also recorded eastwards in Natal and northwards in the Transvaal.

Dioscorea rupicola K. S. Kunth, Enum. Pl. V, 378 (1850); Baker, Fl. Cap. VI, 249 (1896–97); R. Knuth, Pflanzenreich, 87, IV. 43, 186 (1924) fig. 38 A–J. Fig. 4 and 5.

Plants dioecious, aerial stem dying back seasonally and being renewed from the tuber-crown.

Tuber perennial, hypogeal; in juvenile plants pear-shaped, formed at base of first leaf, presumably of hypocotylar origin, up to 15 mm long, 10 mm diam at base, the apex forming the crown, the base developing a finger-like tuber; in adult plants crown cylindrical, vertical, up to 4 cm long, 4 cm diam, up to 15

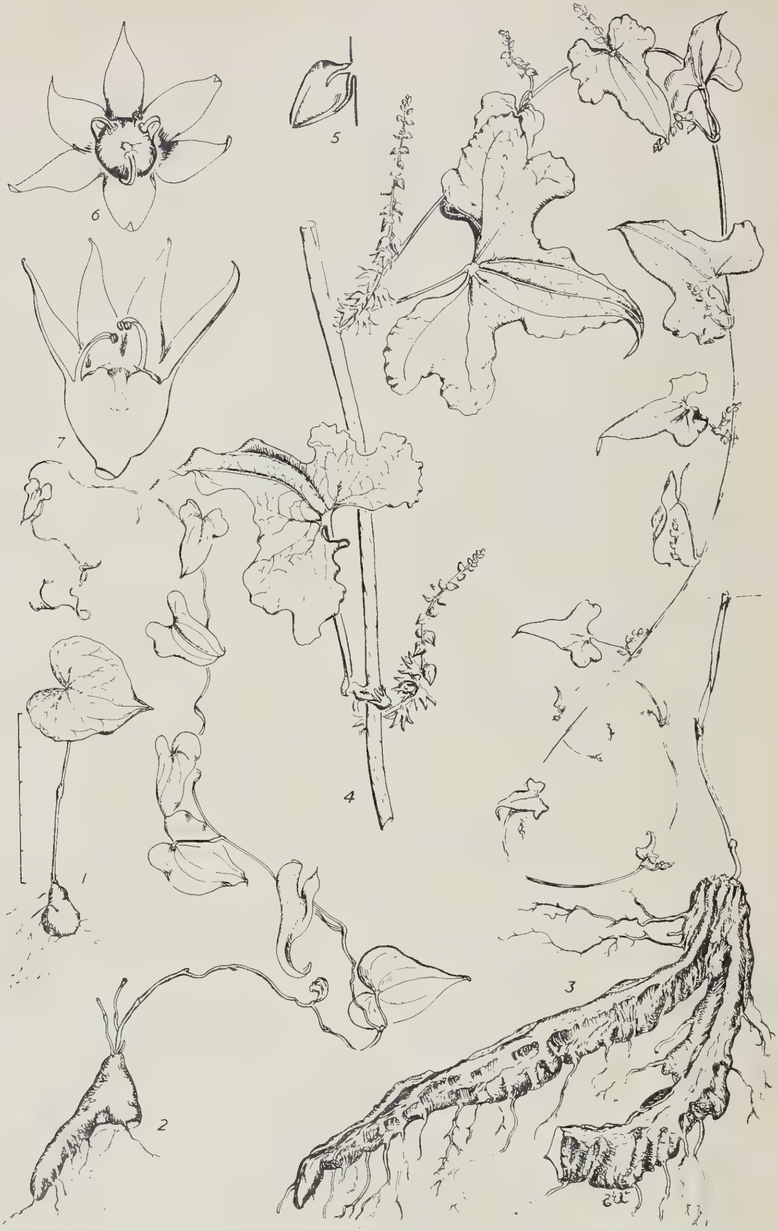


FIG. 4.

D. rupicola. 1 Seedling; 2 juvenile plant; 3 adult tuber; Male plant: 4 inflorescences, 5 bud, 6, 7 flower in surface and sectional views. Scale = 50 mm fig. 1—4; scale = 5 mm fig. 5—7.

cm below soil surface, sides irregularly ribbed, corky, apical growing point slightly convex with hard, brown, deltoid bracts up to 15 mm long, with remains of 2–3 decaying basal parts of previous shoots; tuber of 1–3 branches from base of crown, up to 30 cm long, irregularly rhomboidal in transverse section, up to 1 cm broad at top, 3 cm broad at base, 3 cm thick, base with irregularly lobed margins giving rise to numerous wiry roots, outer parts dark-brown or black, tough, corky, fissured, inner tissue white, brittle.

Stem solitary, climbing, sinistrorse, becoming branched above on emerging on sides of forest shrubs, reaching height of approx. 3 metres, growth commences in late spring (late October); underground portion of stem whitish, twisting unevenly to avoid obstructions; bracts deltoid, up to 6 mm long, 3 mm broad at base, apex beak-like, recurved; aerial stem cylindrical or slightly angular, up to 4 mm diam, finely ribbed, brown or liver-coloured, with greenish linear markings up to 5 mm long, glabrous, lowermost internodes about 2.5 cm long, upper internodes up to 10 cm long, somewhat fleshy, lax.

Leaves exstipulate, alternate, bifacial, glabrous, deciduous; lower pulvinus conspicuous, variously twisted to present upper surface of lamina at right angles to incident light, generally lighter in colour than stem, broadly cordate at base, thicker than petiole, gradually tapering upwards into petiole, up to 8 mm long; upper pulvinus slightly thicker and paler than petiole, widening above to merge with lamina; petiole of adult leaves concolorous with stem, glabrous, finely ribbed with narrow channel on adaxial surface, 1.5–7 cm long, up to 2 mm diam; lamina of seedling leaves very broadly ovate, up to 5 cm long, only slightly longer than broad, deeply cordate, sinus acute, auricles about one-third length of lamina, 7-veined, margins entire or very slightly indentate, apex acute; lamina of leaves of juvenile plants ovate, about 3.5 cm long, 2.2 cm broad, auricles about one-fifth length, sinus less acute, occasionally with slight lateral lobes, apex acute; lamina of mature leaves hastate, 5-lobed or occasionally 7-lobed, slightly longer than broad, very variable in size, the largest leaves frequently subtending well developed ♂ or ♀ inflorescences, up to 14 cm long, 11 cm broad, central lobe deltoid, acuminate, acute, slightly mucronate, lateral lobes rounded, sinus obtuse, rounded, margins undulating, indentate, upper surface dark, glossy green with depressed veins, under surface duller, paler, with prominent veins.

Male Flowers. Inflorescences appearing early in November. Racemes solitary, simple, spike-like, up to 8 cm long, erect or twisting into an erect position if shoot pendant, not hidden by leaves, with up to about 30 sessile flowers; buds turbinate, acute, initially erect; flowers solitary, pendant, with a light, sweet scent; bract and bracteole linear, slightly broader at base, a half to one-third ength of perianth, glabrous; perianth campanulate, segments about one and a half times as long as fleshy receptacle, joined at base for about one-sixth of length, slightly spreading, yellowish-green on both sides, ovate-lanceolate, about 4.5 mm long, 1 mm broad at base, fleshy, margins entire, apex acute, inflexed; stamens characteristically 3, filaments arising between the base of the segments and the inner fleshy disc, up to 1.5 mm long, slender, cream, anthers bilocular, introrse, dorsifixed, yellow, about half as long as broad; staminodes wanting; disc thick, fleshy, about 2 mm diam, rounded on top with three slightly raised portions alternating with stamens, hollow in centre, reddish-pink; style absent.

Female Flowers. Inflorescence solitary, pendant, spike-like, hidden by subtending leaf, rachis up to 10 cm long, with up to 16 almost sessile flowers; flowers spreading or somewhat erect; buds turbinate, pendant, acute; bract and bracteole acuminate, acute, about one-seventh length of ovary, whitish-green; perianth rotate when fully open, more frequently appearing campanulate due to partial closure, about 10 mm diam, yellowish-green; segments lanceolate, acuminate, almost free, about 4 mm long, 1 mm broad at base, fleshy, margins entire, apex acute, inflexed with a small slightly red-coloured tubercle on dorsal side; staminodes 3, erect on margin of disc, less than 0.5 mm. long, anthers rudimentary; disc fleshy, about 2 mm diam, flat on top, depressed in the centre, green with a spot of red opposite each staminode, becoming pale maroon in older flowers; style cylindrical, about 1 mm long, upper part 3-branched, branches recurved at right angles to style and about half its length, apices opening vertically into bi-labiate stigmatic surfaces; ovary inferior, green, pendant but assuming lateral or nearly upright position as flower opens, 8—10 mm long, about 2 mm diam, joined to flower by pseudopedicel about 0.5 mm long, trilocular, in transverse section triangular with rounded angles and rib protruding on middle of each side, when seen longitudinally with a raised rib running down each side, glabrous, with two ovules borne about half-way up each loculus.

Fruit. Rachis remains pendant, pedicel thickens and elongates, twisting upwards and bearing developing capsule erect, when ripening each cluster of fruit hidden by subtending leaf; ripe capsule up to 3 cm long, 1.5—2 cm broad, broadly ovoid, triangular, three-winged, smooth, slightly glossy, light brown, terminated by persistent dry perianth, dehiscing early in May.

Seeds. Two in each loculus, circular, flat, 6 mm diam, wing bilateral, membranous, reddish-brown, up to 20 mm long, 8 mm wide.

Habitat. This species occurs at altitudes of 4,000 to 5,500 ft on shady eastern and southern slopes in moist black doleritic soils formed under temperate rain forest in which *Podocarpus falcatus* and *Olea capensis* are common. It grows as a creeper on marginal shrubs at edge of forest or in clearings, generally where dolerite boulders are lying and it is to this the specific epithet probably refers.

Distribution. TYPE. Cape Province, Ecklon and Zeyher (fide Knuth) Hort.

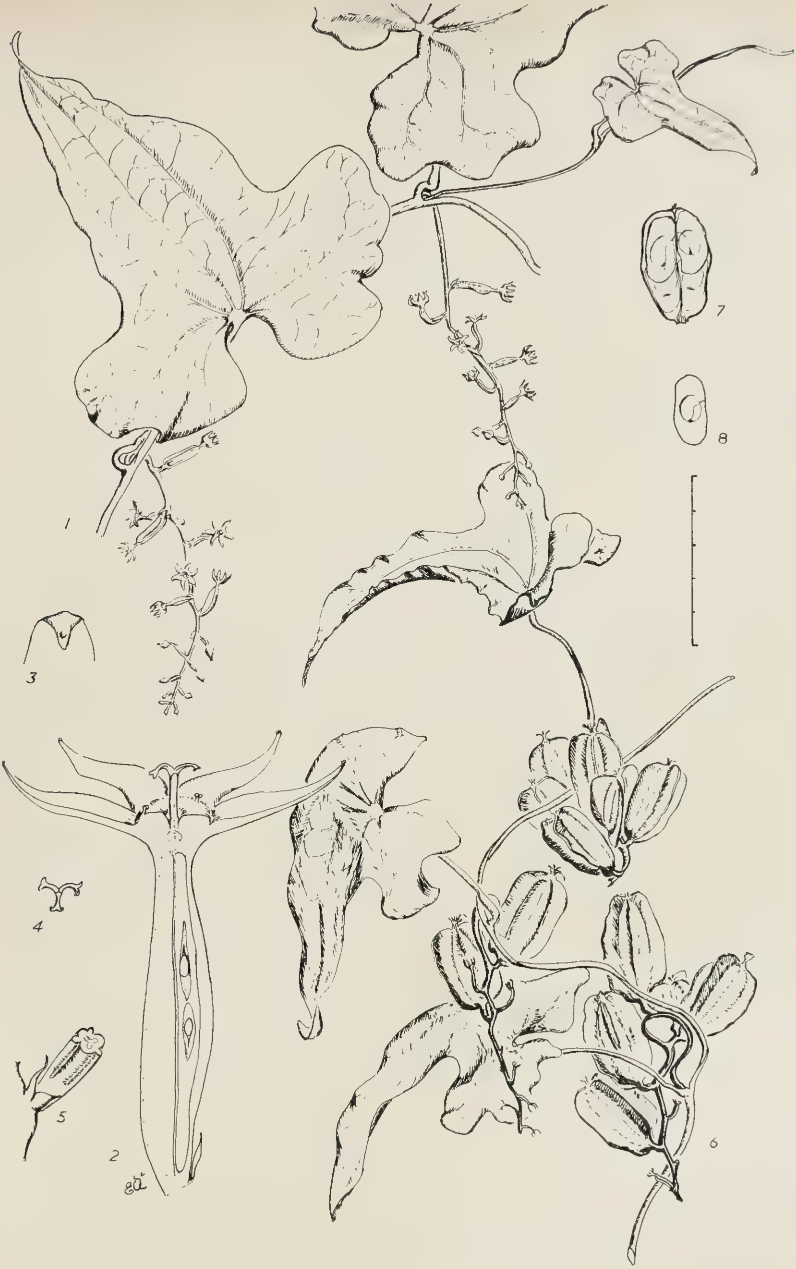


FIG. 5.

D. rupicola. Female plant: 1 inflorescence; 2 flower sectional view, 3 tip of segment, 4 style branches, 5 ovary with end in sectional view; 6 ripe fruit; 7 capsule in sectional view; 8 seed. Scale = 50 mm fig. 1—6; 8, scale = 10 mm fig. 5, scale = 5 mm fig. 2, 4; scale = 2 mm fig. 3.

Berol., (duplicates Hb. Petrograd 3.21.12 and Royal Botanic Gardens, Kew). Note: Ecklon left the manuscript name *Testudinaria rupicola*, which was adopted by K. S. Kunth in naming the species. Ecklon and Zeyher explored the upper reaches of the Kat River Valley about 1830, a region about 20 miles north-west as the crow flies from the Hogsback, which is one of the most westerly of the present day localities of the species.

CAPE PROVINCE: Drege 4498 (no specific locality); Fort Beaufort Division, Hogsback, Acocks 11019 (N), Archibald 7551, 7552, 7557, 7558, 7560 (AM, B, K, N), Barker 1997 (NBGK), Hill 3139 (RU), Johnson 1273 (AM, N), Noel 304, 8563 (RU); Stutterheim Division, nr. Frankfort on Stutterheim Rd. Comins 1425 (AM). Also recorded from Transkei, Pondoland, Natal and Swaziland.

Dioscorea mundtii Baker, Journ. Bot. XXVII, 1 (1889); Fl. Cap. VI, 248 (1896–97); R. Knuth, Pflanzenreich, 87, IV. 43, 94 (1924) fig. 20 H. Fig. 6 and 7.

Plants dioecious, with upper leafy parts dying back seasonally and being renewed either from an axillary bud of the aerial stem or from the tuber-crown.

Tuber perennial, hypogeal; in seedling pear-shaped, formed at base of first leaf, presumably of hypocotylar origin, up to 10 mm long, 7 mm diam at base; in juvenile plants crown cone-shaped, about 3 cm long, about 2·5 cm diam at base, sides longitudinally ribbed, basal margin undulating giving rise to one or two finger-like branches, about 5 cm long, 0·7 cm thick. In adult plants crown up to 15 cm below soil level, vertical, cylindrical, about 5 cm long, 2·5 cm diam, upper part formed of enlarged, corky bracts; tuber branches generally two, horizontal or coiled round roots or stones, occasionally branching dichotomously, up to 35 cm long, rhombic in transverse section, up to 2 cm broad on top, base up to 4 cm broad, with undulating margins, producing strong wiry roots about 1 mm diam, outer skin hard, corky, black, with irregular cracks, inner flesh white, brittle. Tubers, when eaten by predators, protect the wound by cork formation and are apparently capable of forming a new growing point if original is damaged.

Stem solitary, climbing, sinistrorse, much branched above, upper part deciduous, main stem and lower laterals may persist more than one season, a new shoot is formed late in January or February, from the crown if the main stem dies right back, or from several axillary buds of the aerial stem up to about 3 metres above ground; subterranean parts of stem yellowish-white, irregularly swollen up to 4 mm thick, nodes with lanceolate-acuminate bracts up to 7 mm long; aerial stem up to 2 mm thick, glabrous, smooth, dull green to liver-brown, climbing up to about 5 metres, with trailing or pendant laterals.

Leaves exstipulate, alternate, bifacial, glabrous, deciduous; lower pulvinus up to 5 mm long, 2 mm diam at base, narrower above, brownish-green; upper pulvinus very slightly thicker than petiole, about 1 mm long; petiole up to

30 mm long, 1 mm diam, channelled above, rounded to slightly ribbed below, twisted, olive- or brownish-green; lamina of seedling, juvenile and adult plants essentially similar in shape, broadly ovate, acuminate, slightly mucronate, deeply cordate with auricles up to one quarter total length, seedling lamina 3·5 cm long, 2·5 cm broad, adult lamina up to 9·5 cm long, 8 cm broad, horizontal or somewhat pendant, 7-veined, upper surface slightly glossy, pale yellowish-green, veins somewhat depressed, margins entire, lower surface duller, darker, veins and margins somewhat protruding. Leaves subtending male inflorescences are twisted away from the spike, those subtending female inflorescences are much larger and hide even the ripening clusters of fruit.

Male Flowers. Inflorescences appear in April, racemes single or in axillary fascicles, erect, simple or sparingly branched, up to 10 cm long, pale green; flowers numerous, single or in small clusters; pedicels 0·5 mm or less; bract and bracteole, greenish-cream, 0·5 mm or less, broadly ovate, bract acute, finely mucronate, bracteole shorter, obtuse; buds globular, erect; perianth pale greenish-cream, funnel-shaped, 4·5 mm diam; segments about 2·5 mm long, less than 1 mm broad, lower third joined, free above, ovate, outer deflexed, inner speading, straight, margins deflexed; stamens six, outer attached to lip of cup, inner slightly lower, filaments less than 1 mm long, incurved, white, anthers introrse, dorsifixed, pollen yellow; style rudimentary, tripartite, cone-shaped, about half length of perianth cup.

Female Flowers. Inflorescence solitary, pendant, up to 8 cm long, pale green, with up to twelve very shortly pedicellate flowers; bract and bracteole, about 1 mm long, ovate, acuminate, concolorous with ovary; buds ellipsoidal, pendant; perianth greenish, rotate, about 3·5 mm diam; segments equal, about 2 mm long, joined at base for about one-third of length, elliptical, acute; stamens rudimentary, joined to lip of perianth, filaments minute, incurved, green, anthers nodular swellings; style about 1 mm long, slender, cylindrical, branches three, spreading at right angles to style, about 0·5 mm long, apices flared, bilobed, lobes folded downwards; ovary inferior, about 5 mm long, about 1 mm diam, joined to perianth by 1 mm long pseudo-pedicel, narrowly elliptical, green, longitudinally 3-ribbed, glabrous.

Fruit. Rachis remains pendant, pedicels thicken and elongate to about 3 mm, turning upwards and bearing developing capsules erect; ripe capsules trilocular, three-winged, in side view oblong, up to 3·5 cm long, 1·5 cm wide, light biscuit-coloured, smooth, dehiscing from apex for about one-quarter of length, shedding seeds from December onwards.

Seeds two in each loculus, flat, almost circular, up to 7 mm diam, dark-brown; wing proximal, membranous, light-brown, up to 20 mm long, 7 mm wide.

Habitat. A coastal species with distribution apparently restricted to the

George and Knysna Divisions it occurs on fixed dunes, from about 10 feet above sea level, under bush which forms a 10 to 15 ft canopy. Common species of this community are *Sideroxylon inerme*, *Rhus sp.*, *Cassine sp.* and *Brachylaena elliptica* which with other species gives rise to a thick litter covering dark-brown loamy sand which overlies pale dune sand to a depth of about 25 cm. *D. mundtii* also occurs on the margin of temperate forest bordering the escarpment behind the dunes. Here *Podocarpus falcatus* is dominant and the soil is a reddish brown loam. This coastal region has a rainfall of about 45 inches per annum and is frequently covered by heavy sea mists.

Distribution: TYPE. Cape Province: Without locality, Mundt (K). Knysna Division, Koratra, below 1,000 ft J. F. Drège 8559 (K). Leopold Mundt of Berlin came to Cape Town as a chemist and was commissioned by the Prussian Government to collect plants, in this he was assisted by his gardener Maire. He visited George Rex in the Knysna District. Apparently he was rather profligate and his stipend from Prussia was withdrawn. "Two wagon loads" of his specimens were sent back to Germany in 1822 on the same ship as the first specimens collected by C. F. Drège. The name he appended to his herbarium specimen of this species was *Teschidinaria nemorum* (of the woods) which shows he was impressed by the forest in which he must have found it.

CAPE PROVINCE. George Division, Wilderness Forest, Compton 10683 (NBGK), Kaaiman's Gat, Archibald 7561/a (AM), Fairy Knowe, Archibald 7583 (AM), 8004 and 8005 (AM, K, N); Knysna Division, Groot River, Fourcade 1232 (B), Groot River, Blue Rocks, Archibald 7559 (AM), 7560 (AM, K, N), 7561 b (AM) 7564 (AM), Groot River, Natures Valley, Archibald 7569 and 8003 (AM, K, N).

Dioscorea burchellii Baker, Journ. Bot. XXVII, 1 (1889); Fl. Cap. VI, 247 (1896–97); R. Knuth, Pflanzenreich 87 IV. 43, 94 (1924). Fig. 8.

Plants dioecious, leafy shoot dying back periodically and being renewed from the tuber-crown or possibly from a persistent portion of the aerial stem.

Tuber perennial, hypogeal; seedlings not seen. Juvenile plants with shoots up to 30 cm long and withered remains of up to six previous shoots, have conical crown up to 5 mm long, 5 mm diam at base, lower part of tuber with 1—3 horizontal, cylindrical branches up to 25 mm long, 5 mm diam, with thin brown outer skin and numerous fine fibrous roots. In adult plants crown vertical, up to 30 mm long, 25 mm diam, lower part with up to four horizontal branches up to 90 mm long, 30 mm thick, angular, irregularly twisted, outer skin corky, blackish-brown, finely and irregularly reticulate, inner flesh white, hard, brittle. Tubers eaten by small tunnelling predators (? small moles), if growing point injured a secondary growing point may form from another portion of the tuber.

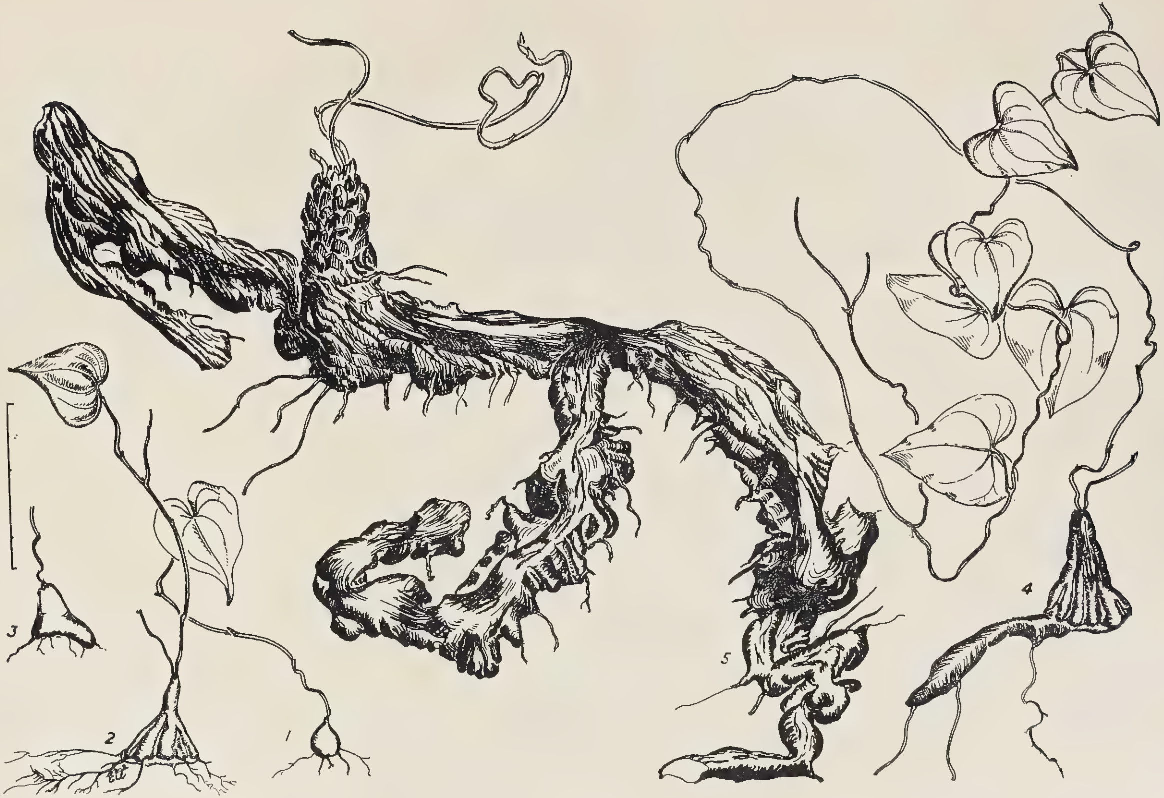


FIG. 6.

D. mundtii. 1 Seedling; 2—4 stages in development of juvenile plant; 5 adult tuber from Kaaiman's Gat with dead shoot of previous season and two new shoots forming (mid-January). Scale = 50 mm.

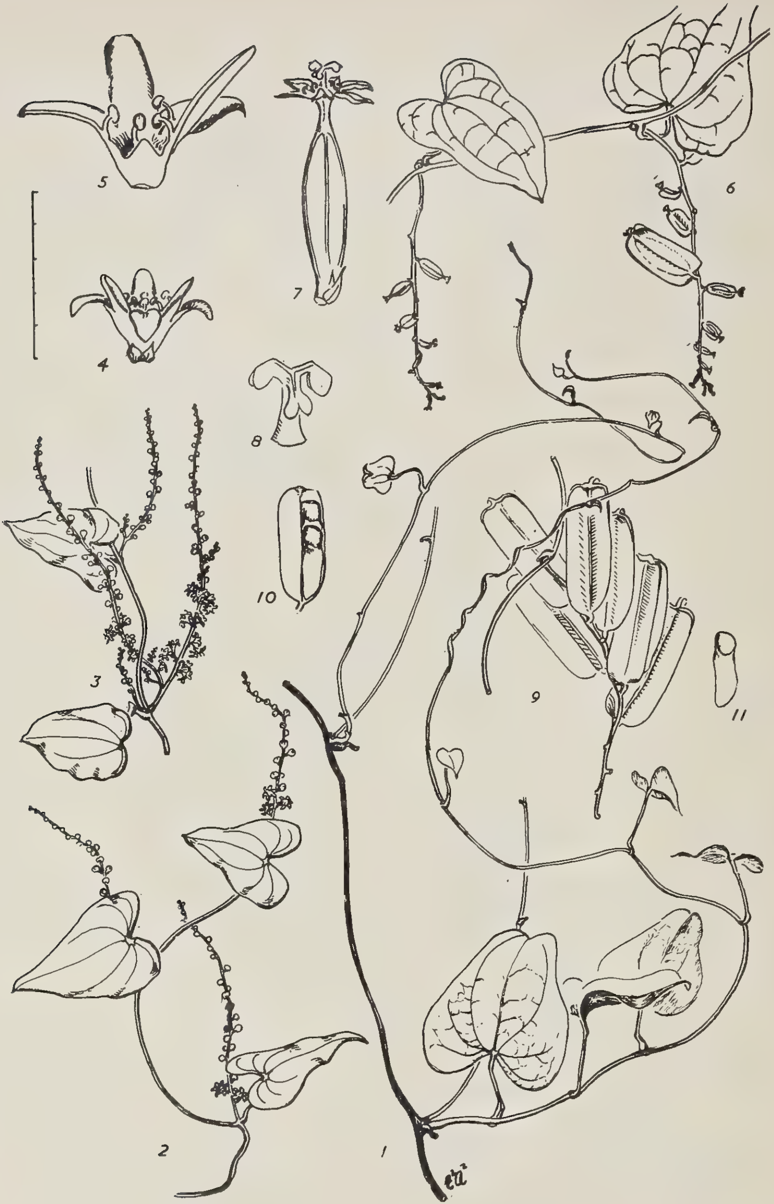


FIG. 7.

D. mundtii. 1 Portion of aerial stem showing regeneration from axillary buds (perennating portion shown in black); Male plant: 2, 3 simple and compound inflorescences, 4, 5 flowers in side and sectional views. Female plant: 6 inflorescences, 7 flower, 8 style branches; 9 ripe capsules; 10 longitudinal section of capsule; 11 seed. Scale = 50 mm fig. 1—3, 6, 9—11; scale = 10 mm fig. 7; scale = 5 mm fig. 4; scale = 3 mm fig. 5; scale = 2 mm fig. 8.

Stem solitary, climbing, sinistrorse, sparingly branched, upper part deciduous, regeneration from lower part of aerial stem probable but not definitely observed, growth commencing December–January; subterranean portion irregularly swollen, up to 4 mm thick, whitish, nodes up to 4 cm long, bracts minute; basal parts of aerial stem leafless, partially prostrate, wiry, 1—2 mm thick, internodes 4—5 cm long, finely ribbed, smooth or slightly scabrid, with black spots or small yellowish tubercles, bracts up to 2 mm long, swollen at base, hard, with recurved beak-like apex occasionally with small inconspicuous stipules; leafy portion of stem climbing to height of about 2 metres, dark greenish-brown.

Leaves alternate, bifacial, glabrous, deciduous, generally exstipulate but occasionally with very inconspicuous stipules less than 1 mm long at base of earlier formed leaves; lower pulvinus up to 2 mm diam, slightly scabrid or tubercular; upper pulvinus not clearly differentiated from petiole, smooth; petiole up to 15 mm long, pale brownish-green, finely ribbed, channelled above, occasionally slightly scabrid; lamina pendant, in basal leaves of juvenile plants broadly ovate, 10 × 10 mm, to ovate 20 × 15 mm, cordate, sinus generally acute, apex obtuse to acute, apiculate, in leaves of adult plants ovate, 32 × 13 mm, to narrowly ovate, 44 × 8 mm, with slightly cordate or rounded base, if cordate sinus very shallow, occasionally with slight basal lobes, 5—7-veined, pliant, soft, acuminate, apex apiculate, occasionally slightly mucronate, upper surface dark matt green with lighter spots, raphides present in lamina and petiole, under surface paler, margins entire, slightly decurved. In only plant seen with female flowers leaves were consistently of the long narrow shape, other plants with similarly shaped leaves were flowerless at the time of observation.

Male Flowers. Inflorescences present April–June, racemes single, *pendant* simple or very occasionally with lowest node subtending a cluster of flowers, up to 30 mm long, pale green; flowers pendant, up to 12 in number, very shortly pedicellate; bracts and bracteole concolorous with perianth, ovate, acute, less than 1 mm long; buds globular pendant; perianth creamy-white, saucer-shaped, almost rotate, 5—6 mm diam, persistent when dry; segments elliptic, up to 3 mm long, 1 mm broad, joined for about one-third of length, outer spreading, inner slightly shorter, incurved, margins entire, apex obtuse, minute concolorous granules are present in perianth tissue, more numerous in lower half of segments, conspicuous as liver-coloured streaks in dry persistent flowers of type; stamens six, outer attached to lip of perianth, inner slightly lower down, filaments incurved, about 1 mm long, white, anthers introrse, pollen yellow; style vestigeal, slightly convex, indefinitely tripartite.

Female Flowers. Inflorescence (only one example seen) pendant, simple, 30 mm long, pale green; flowers two, sessile, pendant; bracts and bracteole subtending each flower, green, bract lanceolate, less than 1 mm long, bracteole linear, shorter; buds globular; perianth ? greenish-white, cup-shaped (fully open flowers not seen); segments equal, joined in lower third, ? about 1 mm long, 0·8 mm wide; stamens rudimentary, attached to lip of perianth cup, filaments white, minute, anthers bilobed; style cylindrical, about one-third length of segments, white, erect, style branches three, spreading at right angles to style, apices flared, bilobed; ovary inferior, 3 mm long in bud, about 1 mm diam, green, glabrous, longitudinally three-ribbed.

Fruit and *Seed* not seen.

Habitat. Growing at altitudes of 600—1,500 ft. on south facing quartzitic slopes in moist black sandy soil following lines of drainage. *D. burchelli* occurs in very dense fynbos communities where bushes may reach a height of 12 ft or more and where *Protea neriifolia* is one of the commonest plants together with species of *Restio*, *Thamnochortus*, *Indigofera*, *Leucodendron* and *Erica*. Its shoots may climb about three-quarters of the way up the surrounding vegetation but although flowering, have not been seen to reach the top. They are thus not exposed to direct sunlight. The tubers are very thickly surrounded by the roots of other plants as the community is so dense.

Distribution. TYPE. Cape Province. George Division, Forest near Touws River, Burchell 5728 (K).

CAPE PROVINCE: George Division, Woodifield, Archibald 7582, 7584, 7591, 7592 (AM, K, N) 7587, 7585 (AM); Knysna Division, Concordia Plantation, Keet 666 (AM, N), Mrs Dalgairns s.n. (AM); Uniondale Division, Prince Alfred Pass, Fourcade 1272 (B); Humansdorp Division, Karreedouw Pass, south side, Fourcade 1175a (B), Hankey, Fourcade s.n. (on same sheet as Fourcade 1272, (B)), Assegai Bosch, Thode 2577 (N). Without locality, Mund and Maire s.n. (as quoted by R. Knuth, but not seen by author). A male plant has been cultivated for a number of years by Miss Grace Britten at Albany Museum Herbarium Garden, locality unknown, herbarium specimen Archibald 7563b (AM).

Dioscorea stipulosa R. Knuth (ex Uline msc), Pflanzenreich 87, IV. 43, 94 (1924). Fig. 9.

Plants dioecious, leafy shoot dying back periodically and being renewed either from crown of tuber or possibly from an aerial bud if shoot does not die back completely.

Tuber perennial, hypogeal. Seedlings not seen. In adult tubers crown up to 25 cm below soil surface, cone-shaped, vertical, up to 50 mm long, 15 mm diam, apex with remains of old shoots, lower part with one or more finger-like, horizontal branches, up to 80 mm long, 15 mm thick, outer skin dark-brown, hard horny, inner flesh very compact with pale yellowish tinge; roots thin, wiry.

Stem solitary, climbing, sinistrorse, upper part freely branched, deciduous, lower part possibly persisting for more than one season or renewed *ab initio* from crown, growth commencing October–November; subterranean part with internodes 4—5 cm long, not swollen, with conspicuous ovate-acuminate bracts up to 6 mm long, 2 mm thick at base; aerial stem climbing to height of about 3 metres, internodes up to 10 cm long, up to 2 mm thick, dark-brown, tough, wiry, strongly ribbed, scabrid, with numberous concolorous or black tubercles; bracts on lower part of stem rhombic, acuminate, beaked, rigid, ribbed dorsally, tubercled, with stipular outgrowths up to 1 mm long.

Leaves alternate, bifacial, glabrous, deciduous, stipulate; stipules simple or compound, persistent, subulate, up to 1 mm long, inconspicuous on leaves of ultimate laterals; lower pulvinus greenish-brown, up to 2 mm long, concave above, swollen laterally and dorsally, ribbed, scabrid, generally tuberculate; upper pulvinus inconspicuous; petiole about 1 mm diam, up to 15 mm long, deeply channelled on upper surface, rounded and ribbed below, twisted or straight, erect or spreading, occasionally sparsely tuberculate, concolorous with stem; lamina spreading at right angles to incident light, stiff, brittle, 5—7 veined, base rounded or cordate with obtuse sinus, not lobed, lower shade leaves broadly ovate, up to 45 × 40 mm, upper leaves ovate, very variable in size, up to 45 × 18 mm, upper surface dark green, matt, veins somewhat depressed, stomata absent, undersurface paler green with prominent yellowish veins and margins, stomata present, raphides absent, apex acute or obtuse, mucronate, mucro up to 1 mm, occasionally slightly longer.

Male Flowers. Inflorescences present December-January, occasionally flowers solitary (on young laterals), generally raceme well developed, simple or with short lateral branches, rachis up to 8 cm long, *erect*, pale green, persistent when dry; flowers up to 20 in number, erect or patent, pedicel up to 1 mm long; bracts 2, lanceolate, lower about 1 mm long, upper about half as long, concolorous with perianth; buds globular, erect; perianth cream, funnel-shaped, 3—4 mm diam, persistent; segments about 3 mm long, 1 mm broad, lower third joined, outer spreading elliptic, acuminate, acute, inner incurved, margins reflexed, somewhat concave in centre, apex obtuse, tissue without granules; stamens 6, outer inserted on lip of tube, inner slightly lower, about two-thirds length of segments, incurved, anthers basifixed, introrse, pollen yellow; style a rudimentary swelling on floor of receptacle.

Female Flowers. Inflorescence pendant or spreading, rachis simple, ribbed, up to 7 cm long; flowers up to 10 in number, inconspicuously pedicellate, patent; bract lanceolate, narrowly acuminate, up to 3 mm long, bracteole about half length of bract, pale green; buds globular; perianth rotate, pale green, about 4 mm diam; segments about 2 mm long, joined for about one-quarter of length

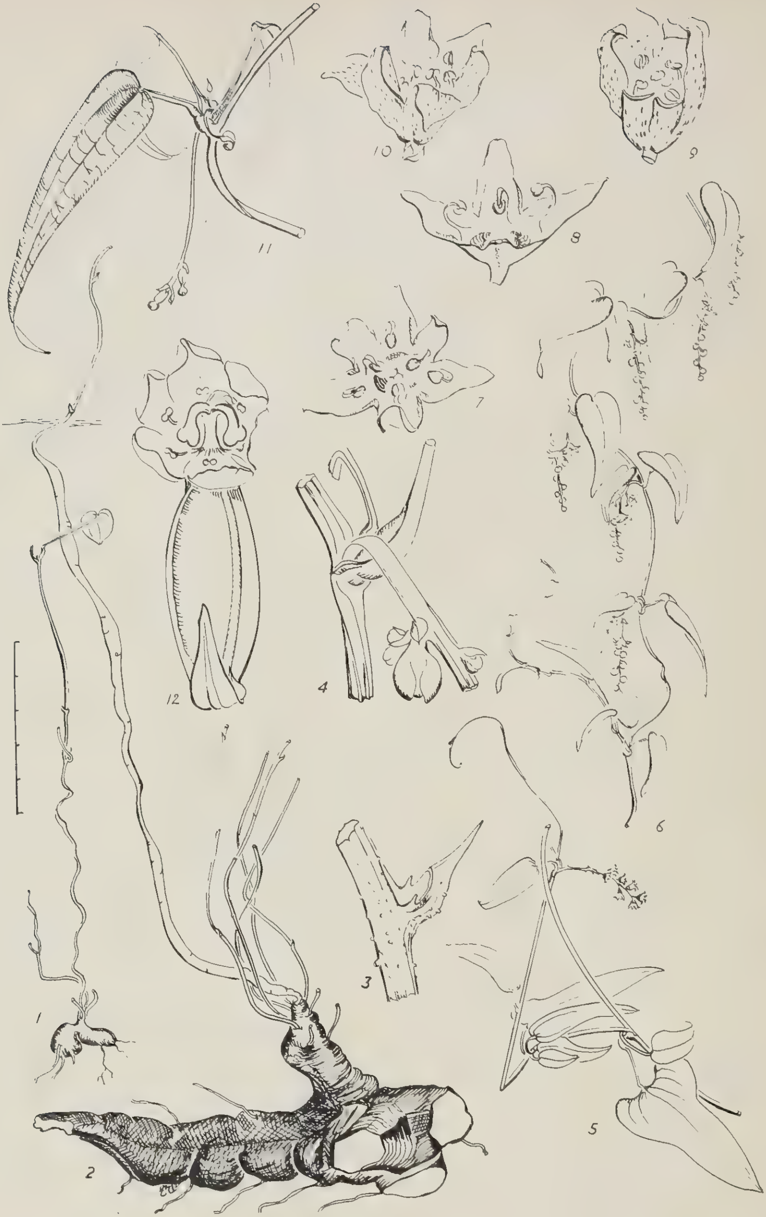


Fig. 8.

D. burchellii. 1 Juvenile plant; 2 adult tuber with current season's shoot and remains of previous shoots; 3 bract near base of main stem; 4 base of leaf subtending male inflorescence; Male plant: 5 portion of Type, Burchell 5728, 6 inflorescencences, 7, 8 flowers in surface and sectional views, 9 Burchell 5728 and 10 Archibald 7591 (flowers shaded to show petaloid inclusions); Female plant 11 inflorescence, 12 flower. Scale = 50 mm fig. 1, 2, 5, 6; scale = 25 mm fig. 11; scale = 5 mm fig. 3, 4, 7—10; scale = 2 mm fig. 12.

at base, ovate-lanceolate, acute, with median vein; stamens 6, rudimentary, joined to segments about one third from base, filaments incurved, anthers globular; style cylindrical, about 0.5 mm long, style branches 3, horizontal, slightly thinner and shorter than style, apices bilobed, deflexed; ovary inferior, about 5 mm long, 1 mm diam, narrowing towards base, green, glabrous, longitudinally ribbed, trilocular, triangular in cross section.

Fruit. Rachis becomes *erect* as fruit ripens, pedicels thicken, elongating to about 5 mm; capsules erect, winged, up to 2.5 cm long, 1.5 cm broad, elliptical or oblong-elliptical, terminated by persistent perianth, smooth, light yellowish-brown, with minute brown spots, ripening in April.

Seeds two in each loculus, flat, circular, about 5 mm diam, wing proximal, variable in size, up to 12 mm long, 6 mm wide, russet-brown, membranous.

Habitat. Growing on south facing slopes beside streams or in line of seepage in moist black soil derived from dolerite. *D. stipulosa* occurs in low fynbos about 3 ft high composed of species of *Anthospermum, Cliffortia and Indigofera*, or in low, 10 ft, riverine bush containing species of *Leucosidea*, *Rhus* and *Melianthus*.

Distribution: TYPE. Cape Province, without locality, Ecklon and Zeyher, 4.47.5. (Mus. bot. Berol). (Photo only seen). (Ecklon and Zeyher 4.47.5 at Kew is "probably a duplicate of the holotype" fide E. Milne-Readhead.) Note: Ecklon and Zeyher collected in the divisions of Fort Beaufort and Bedford. CAPE PROVINCE: Fort Beaufort Division, Tor Dun, Hogsback, Archibald 7554, 8002 (AM, K, N), Hogsback, Rattray 70 (AM), Johnson 1160, 1299 (AM), Noel 11051, 12179, 8562 (RU), Archibald 5911 (AM); Bedford Division, Killick (AM, N); "British Kaffraria" Barber 34 (AM).

Dioscorea sylvatica Ecklon, S. Afr. Quart. Journ. I, 363 (1830). For full literature and synonymy see Burkill, Journ. S. Afr. Bot. 18, 188 (1952). Fig 10 and 11.

Plants dioecious, upper leafy parts dying back seasonally and being renewed either from the crown or, if the aerial stem persists, from aerial buds.

Tuber perennial, hypogeal or with up to one-third exposed; in seedling globular or pyriform, formed at base of first leaf, presumably hypocotylar in origin, up to 10 mm diam; in juvenile plants broadening at base becoming bun-shaped, with short, conical crown. In adult plants crown inconspicuous, marked by few persistent bases of old shoots and by membranous, deltoid, brown bracts about 1 cm long; tuber varying in size and shape according to physical conditions of terrain, in coastal dune sand with crown 25 cm or more below soil surface, about 12 cm thick, up to 1 metre diam, margin irregular with deeply incised, bifurcating lobes which may overlap, outer skin dark brown, corky, hard, finely and irregularly reticulate; on shallow soils or rocky slopes irregularly lenticular, up to 20 cm thick, up to 40 cm diam, up to 9 kg in weight, crown and upper third exposed, with brownish-grey, hard, corky, 4- to 7-sided shields up to 10 mm thick, up to 40 mm across, subterranean part, finely reticulate, corky; in deep forest soils hypogeal, lenticular, outer skin finely reticulate, corky; on loose scree slopes 20 cm or more below surface, misshapen by pressure against stones, outer skin grey, about 2 mm thick, smooth inner flesh in all cases white, brittle; roots thin, fibrous, from base of tuber only.

Stem solitary, very occasionally more than one, climbing sinistrorse, much branched above, deciduous or main stem and lower laterals persisting for more than one season, growth commencing August-September; lower part up to 1 cm diam, glabrous liver-coloured with grey or greenish-grey markings; bracts deltoid, clasping stem, up to 8 mm broad at base, up to 4 mm thick; upper part of stem about 2 mm thick, dull-green to liver brown, climbing to height of 15 metres, ultimate laterals trailing or pendant.

Leaves exstipulate, alternate, sometimes opposite, bifacial, glabrous, deciduous; lower pulvinus up to 7 mm long, 2—3 mm diam at base, tapering above, slightly channelled on upper surface, frequently twisted bring upper surface of lamina at right angles to incident light, brownish-green; upper pulvinus 2—3 mm long, equal in thickness to petiole; petiole up to 25 mm long, 1 mm or less diam, lower surface rounded, upper surface slightly channelled, green, glabrous; lamina in seedlings very broadly ovate, obtuse, 21 × 20 mm, to ovate, acuminate, acute, 22 × 15 mm, cordate, sinus acute, auricles sometimes overlapping, up to one-quarter of total length, mucro less than 1 mm; lamina in juvenile plants ovate, acuminate, acute, 40 × 30 mm, cordate, auricles up to 10 mm, sinus acute, mucro thread-like, 1—2 mm long; in adult plants lamina of lower leaves generally largest, very variable, broadly ovate, acuminate, acute, up to 75 × 63 mm, acutely cordate, auricles 25 mm, or hastate, obtuse, up to 60 × 60 mm, obtusely cordate, auricles up to 28 mm rounded; in lateral shoots bearing inflorescences lamina hastate, obtuse, 24 × 17 mm, obtusely cordate, auricles about 6 mm, rounded, upper part somewhat oblong, less than 8 mm wide for more than half total length, plants with hastate leaves may also show additional lobing opposite second pair of veins, leaves in any one plant very variable in size, frequently larger leaves subtend the main inflorescences; upper surface smooth, slightly glossy, yellowish-green becoming dark green, in eastern districts at higher altitudes sometimes glaucous; lower surface not shining, paler green, veins and margins somewhat prominent; mucro subulate, deltoid, up to 4 mm long, 1 mm thick; occasionally apex emarginate.

Male Flowers. Inflorescences abundant, present November to March, depending on rains, generally solitary, sometimes paired or accompanied by short lateral shoot bearing small leaves and short inflorescences, simple up to 9 cm long, or compound up to 14 cm long, rachis spreading or erect, yellowish-

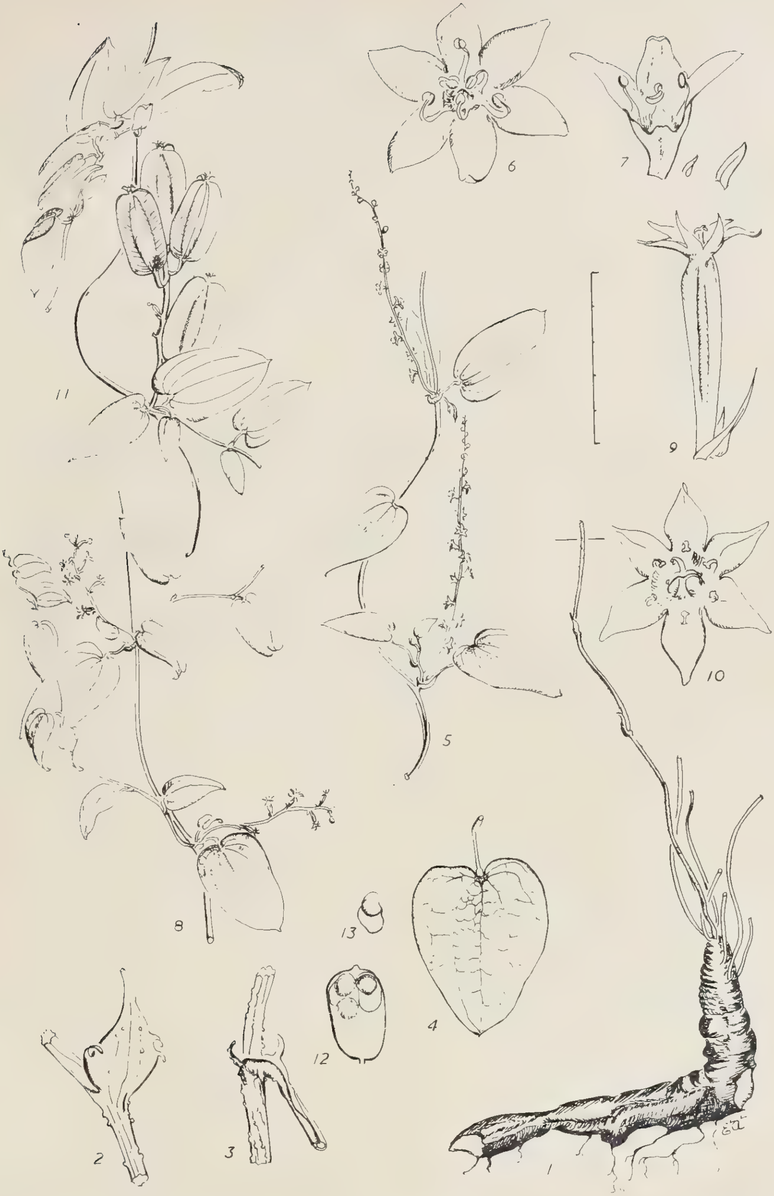


Fig. 9.

D. stipulosa. 1 Adult tuber with current season's shoot and remains of previous shoots; 2 bract from basal portion of aerial stem; 3 leaf-base and stipules; 4 leaf from lower part of main stem; Male Plant: 5 inflorescences, 6, 7 flowers in surface and sectional views; Female Plant: 8 inflorescences, 9, 10 flowers in surface and side views; 11 cluster of ripe capsules; 12 sectional view of capsule; 13 seed. Scale = 50 mm fig. 1, 4, 5, 8, 11—13; scale = 10 mm fig. 2, 3; scale = 5 mm fig. 6, 7, 9; scale = 3·3 mm fig. 10.

green; flowers numerous, spreading, solitary or paired; pedicels up to 6 mm long; bract about 1 mm long, acute, deltoid, bracteole near top of pedicel, lanceolate; buds globular; perianth yellowish-cream, rotate, up to 7 mm diam, segments free almost to base, patent, recurved, outer oblong, about 3 mm long, 1·5 mm broad, margins decurved, apex obtuse, inner segments slightly narrower, shorter, acuminate, acute; stamens 6, filaments white, about one-third length of segments, attached to base of segments, outer erect, inner incurved, anthers dorsifixed, introrse, pollen yellow; style rudimentary, conical, tripartite.

Female Flowers. Inflorescence solitary, pendant, partially hidden by subtending leaf, rachis green, up to 9 cm long; flowers up to 30, spreading or slightly up-turned; pedicels up to 4 mm long; bract and bracteole lanceolate, acuminate, 1—1·5 mm long, bracteole about two-third way up pedicel; buds cylindrical; perianth yellowish-green, rotate, about 6 mm diam, persistent; segments equal, joined only at base, 2—2½ mm long, less than 1 mm wide, oblong, with median vein, obtuse; stamens rudimentary, modular; style cylindrical, erect, about 1 mm long, style branches three, horizontal, slightly shorter than style, apices bilobed, decurved; ovary inferior, joined by a short pseudo-pedicel about 5 mm long to perianth, trilocular, 6—7 mm long, 2 mm diam, narrowing slightly towards top, sharply three-angled, glabrous.

Fruit. Rachis elongates but remains pendant as fruit ripens, pedicels elongate to about twice length bearing ripening capsules erect; ripe capsules oblong, 27 × 15 mm, obovate, 24 × 14 mm, or broadly obovate, 20 × 20 mm, light yellowish-brown with reddish-brown margins and diagonal flecks, ripe July-August.

Seeds one to two in each loculus, elliptical, flattened, 7 mm long, 4 mm wide, wing distal, membranous, reddish-brown, rigid, up to 16 mm long, 6 mm wide.

Habitat. D. sylvatica occurs in a variety of habitats in the Eastern Cape at altitudes ranging from 25 to 4,000 ft but always associated with some form of tree vegetation. In the *locus classicus* at Kraggakama it occurs on sandy soils formed from Table Mountain sandstones and quartzites. At the lowest altitudes of its range it is found in fixed dunes under a canopy of coastal bush In both these localities *Sideroxylon inerme* and *Schotia speciosa* are common. On steep slopes of Witteberg quartzite it is associated with low temperate forest containing *Podocarpus falcatus*, *Schotia latifolia;* on shales of Dwyka and Ecca series it occurs on southern slopes of dry localities supporting low succulent scrub and small tress of *Ptaeroxylon utile* and *Schotia afra*; further north at highest altitudes of its range it occurs as a marginal forest creeper on loamy soils formed from the rocks and shales of the Karoo System.

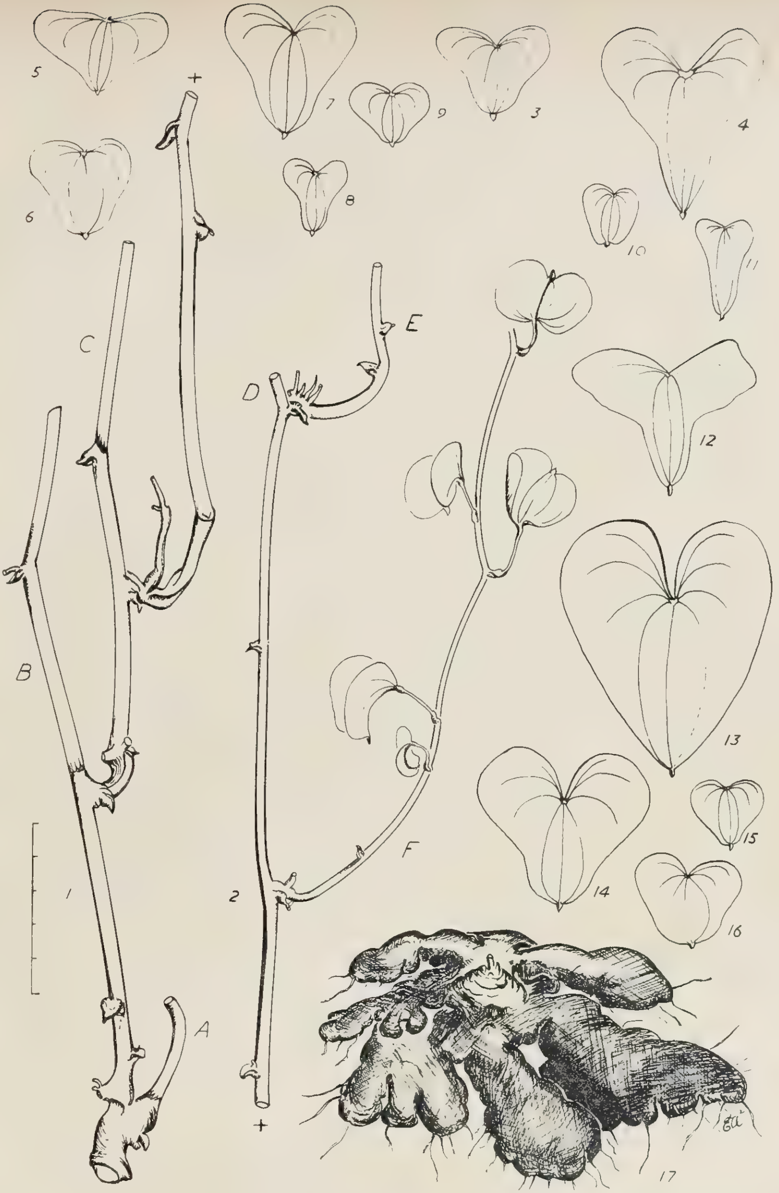


FIG. 10.

D. sylvatica. 1, 2 Basal part of perennating stem from tuber on farm "Waterfall" 29/8/65 showing regeneration from lateral buds; A—C lateral shoots of previous years, F new 3 ft shoot of current season's growth. Leaves: 3 Lectotype, Ecklon & Zeyher Kragga Kamma, subtending ♂ infl.; 4 Archibald 7548, Kragga Kamma, subtending ♀ infl.; 5, 6, Archibald 7534, Rangemore, lowest of main stem, subtending fruit cluster; 7—9 Archibald 7608, Zwartwater Poort, largest from terminal lateral, from base of juvenile plant; 10 Noel 1460, Pluto's Vale, from 3rd node above fruit cluster; 11—12 Archibald 7573, Port Alfred, subtending short & long infls.; 13 Archibald 3411b, Kamaehs, from lower part of main stem; 14, 15 Barber 484 Queenstown, from main stem & lateral; 16 Barber 223 Queenstown, subtending ♀ infl.; 17 Large tuber from dune-sand. Scale = 50 mm fig. 1—16; scale = 50 cm fig. 17.

The tubers of *D. sylvatica* are occasionally cooked and eaten by Bantu people.

Distribution: LECTOTYPE. Cape Province, Port Elizabeth Division (formerly part of Uitenhage Division), "Primitive forest of Krakamma below 500′" Ecklon and Zeyher s.n. Jan. (AM) quoted in Ecklon 3·1. and locality in Ecklon, S.Afr. Quart. Journ. (1830). Actually the earliest recorded specimens are Burchell 3390 (K), collected at Zwartwater Poort on 8th July, 1813 and erroneously determined by him as *D. elephantipes*, and Burchell 4519, "Krakakamma —near the farm house" (K) which was collected on 31st January, 1814. Other important specimens are Zeyher 892 (or Ecklon 892 (K) part of which came from Uitenhage and part from Albany, and Zeyher 4152 (N, AM, K) "Howison's Poort mts and ravines west of Grahamstown".

CAPE PROVINCE: Uniondale Division, nr Wagenboom, north side of Kromme R. Burchell 4855 (not seen); Prince Alfred Pass, Fourcade 3487 (FC in B), Archibald 7588 (AM, K). Knysna Division, East Bank, Keurbooms River, Fourcade 3244 (B), Robberg, Taylor 985 (NBGK); Humansdorp Division, Cambria, Compton 24085 (NBGK); Uitenhage Division, Kamaehs, Paterson 1032 (AM), Archibald 3411b (AM); Port Elizabeth Division, between Kragga Kama and Sea View, Archibald 7458 (AM, K), Port Elizabeth, I. L. Drège 307, (AM), I. L. Drège, Dec., 1908 (N/10799T.M.), Long 921 (AM, N), Paterson, 1033 (AM), van Stadens River Mouth, Pole Evans 4876 (N); Alexandria Division, Bushmans River Mouth, Pole Evans 26M (AM, N), Archibald 4351 (AM), 7350 c/d, 5861 (AM, K, N), Syferfontein, Archibald 7248 (AM); Albany Division, Pluto's Vale, Dyer 1720 (AM), Noel 1460 (AM, RU), Waterfall (part of Thornkloof) Archibald 7610—7617 (AM, N,K), Zwartwater Poort. Archibald 7608 (AM, K); Bathurst Division, Port Alfred, Galpin 363 (N), Tyson June, 1916 (N), Archibald, 7573, 7527/b (AM, K, N), Kowie River, L. L. Britten 5112 (AM), Mentone, L. L. Britten 6465 (AM), Salt Vlei, L. L. Britten 2099 (AM), Kasouga, L. L. Britten 2365 (AM, N), Rangemore Farm. Archibald 7526, 7527, 7528, 7531, 7534, 7541, 7542 (AM); Somerset East Division, Bassonskloof, Bayliss 2895 (AM); Fort Beaufort, Hogsback Pass, Archibald 7556 (AM), Braeside, Story 2216; Queenstown Division, Junction, Farm Station, Galpin 8188 (AM); Stutterheim Division, Rogers 11950.

D. sylvatica and its published varieties:

It is unfortunate that the only characters used in establishing new varieties of *D. sylvatica* were the size, form and texture of the lamina and the size of the capsules. It will be realised from the above description that size and form of lamina vary considerably between juvenile and adult plants, and according to position on a single plant. There is every gradation in size and shape between the hastate leaves on the upper parts of adult plants and the broadly ovate leaves of seedlings as is shown in the accompanying diagrams (fig. 10, 11). Leaf texture and capsule size are characters which are affected by drought conditions which may cause glaucous leaves and small capsules. It is possible that the plants from Pluto's Vale, Hogsback and Queenstown might be considered as a distinctive form but there has been no opportunity for a close study of plants of different ages to confirm this. It might be suggested that difference in size and shape of tubers of dune plants and inland forest plants should be used to separate varieties, but development of juvenile plants is so similar that the author is of the opinion that physical conditions of the soil are important in leading to differences in size and shape of tubers, and that over a period of say 30 years a seedling from rocky quartzitic area would develop into a large, lobed, subterranean tuber if grown in dune sand under coastal bush.

Burkill recognised four varieties based chiefly on differences in size and shape of leaves, but did not state from what portion of the plant the leaves illustrated were taken.

Type localities for published varieties of D. sylvatica.

v. multiflora	(Marloth) Burkill = *D. marlothii*,, R. Knuth = *Testudinaria multiflora* Marloth. Transvaal: Zoutpansberg, near Santa, coll. Dyke as Marloth 5097 (AM).
v. rehmanni	(Baker) Burkill *D. rehmanni* Baker. Transvaal: Zoutpansberg, Houtbosch, Rehmann 7583.
v. paniculata	(Dümmer) Burkill — *D. paniculata* Dümmer. Kew Gardens, Locality unknown. (ref. also *T. montana f. paniculata* O. Kuntze. Natal: Durban.
v. brevipes	(Burtt Davy) Burkill = *T. brevipes* Burtt Davy. Transvaal: Potgietersrus, Leendertz 1510.

Dioscorea elephantipes (L'Heriter) Engler in Engler and Drude, Vegetat. d. Erde, 9.2, 267 (1908): Pflanzenwelt Afr. 2, 362 (1908); *Tamus elephantipes* L'Heriter, Sert. Angl. 29 (1788); *Testudinaria montana* Burchell, Travels Int. S. Afr. 2, 148 (1824); *Testudinaria elephantipes* Lindley in Bot. Reg. pl. 921 (1825). For further references see Burkill, Journ. S. Afr. Bot. 18, 186 (1952). Fig. 12.

Plants dioecious, leafy shoots dying back annually and being renewed from the crown.

Tuber perennial, epigeal; in seedling pear-shaped, of hypocotylar origin (Sparshott, 1935); in adult plants shaped like a beehive, base subterranean (about one-quarter of the whole), up to 60 cm diam, under-surface concave, with circular ridges, not reticulate, periphery irregularly undulating, not conspicuously lobed, with numerous, sparsely branched, wiry roots up to 5 mm thick; upper three-quarters of tuber exposed above ground, total height up to 60 cm (a specimen recorded by Sir William Hooker in Guide to Glasgow Bot. Gard. was 90 cm diam, 210 cm high and weighed about 700 lbs), surface greyish-brown, hard, with numerous 4—7-sided tortoise-like plates of thick cork, plates increasing in number by splitting or *ab initio* from crown, increasing in size by peripheral growth, showing definite growth lines from central umbo, up to 8 cm across, up to 3 cm thick at centre; crown of one or more growing points at top of tuber, somewhat immersed marked by stiff, brown, erect, deltoid, bracts up to 10 mm long, 15 mm broad at base; inner flesh hard, yellowish-white, opaque, brittle. Formerly eaten by Bantu people.

Stems solitary in young plants, 4—7 in older plants from several growing points situated at the top of the tuber, growth dependent on rain, shoots generally appearing October–November, persisting for 10—14 months, if first shoot delayed by drought or injury growth renewed as late as February; main stem erect, rigid, becoming flexuous above, sinistrorse, twining on remains of previous season's shoots or surrounding shrubs, up to 90 cm long, up to 15 mm diam at base, tapering rapidly, glabrous, dark liver-brown, much branched; lateral branches spreading more or less at *right angles*, forming rigid spines in dry weather when flexuous tips are deciduous or in second year after death of shoot.

Leaves exstipulate, alternate, sometimes opposite, bifacial, glabrous, deciduous in dry weather or at end of season; lower pulvinus variable, in leaves of ultimate branches about 1 mm long, 1 mm or less at base narrowing abruptly to width of petiole, in leaves subtending branches up to 5 mm long, base 5 mm wide, 2 mm thick, persistent, hard and woody when leaf falls; upper pulvinus less than 1 mm long, slightly thicker than petiole; petiole about 5 mm long, less than 1 mm diam, glabrous, pale yellowish-green; lamina generally folded upward somewhat about mid-vein, sides closing together in heat or drought, rarely fully expanded, 5—7-veined, size and shape variable, very broadly ovate acute, up to 20 × 18 mm, very broadly ovate obtuse, up to 26 × 32 mm or ovate depressed emarginate, 23 × 37 mm, base rounded or slightly cordate with acute or generally obtuse sinus, pale yellowish-green, somewhat shiny when young, *glaucous* when old, lower surface with slightly protruding yellow veins, apex mucronate, mucro up to 2 mm long, deltoid, greenish-yellow to brown.

Male Flowers. Inflorescences present November–February, solitary or sometimes paired, simple or compound, rachis glabrous, yellowish-green, up to 8 cm long, 3 mm diam at base, tapering, rigid, patent or erect, forming a spine when flowers have fallen; flowers numerous, single or paired, erect or spreading; pedicels up to 5 mm long; bract and bracteole, 1—2 mm long, lanceolate, acuminate, yellowish-green; buds pyriform, erect or spreading; perianth mustard

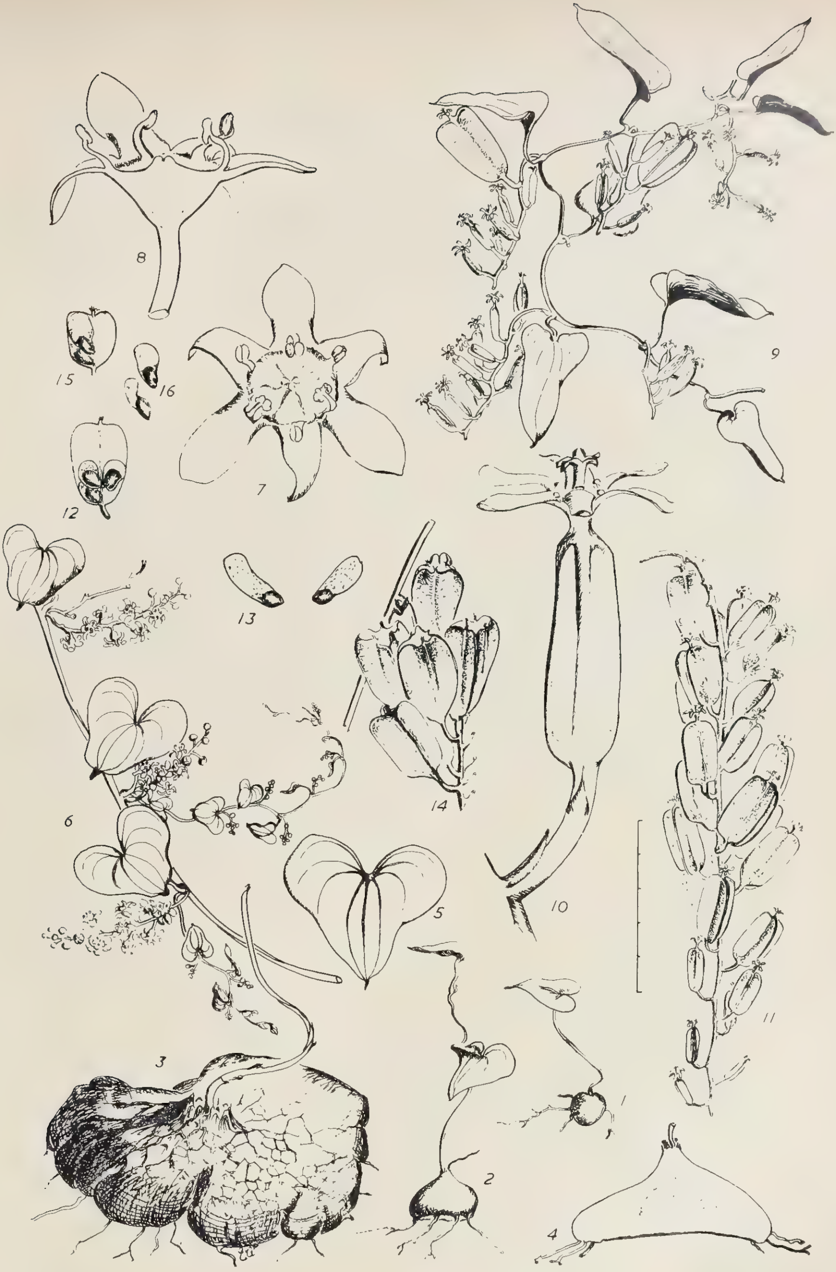


FIG. 11.
D. sylvatica. 1, 2 Seedlings; 3, 4 juvenile tubers; 5 lowermost leaf main stem adult plant; Male Plant: 6 inflorescences; 7, 8 flower surface & sectional views; Female Plant: 9 inflorescence, 10 flower, 11 developing fruit cluster; 12—14 sectional view developing capsule, ripe seed, ripe capsule (from Rangemore); 15, 16 sectional view ripe capsule and seed (from Pluto's Vale). Scale = 50 mm fig. 1—6, 9, 11—16; scale = 5 mm fig. 7, 8, 10.

coloured, funnel-shaped, 6—7 mm diam; segments joined in lower third to form a narrow tube, upper parts spreading, later reflexed, 2.5—3 mm long, 1 mm broad at base, outer spathulate, inner oblong obtuse, apices slightly inflexed; stamens six, inserted at lip of perianth tube, about two-thirds length of segments, erect slightly incurved above, cream, anthers basifixed, about one-third length of filaments, pollen yellow; style rudimentary, cylindrical, up to 13 mm long, apex irregularly tripartite.

Female Flowers. Inflorescences solitary, simple, pendant or spreading, up to 8 cm long, about 3 mm at base, tapering, rigid, becoming spine-like later, with up to 15 flowers; pedicels up to 2.5 mm long; bract and bracteole ovate-lanceolate, bract up to 1 mm long, bracteole shorter, distant at base of ovary, yellowish-green; buds somewhat cylindrical, generally erect by twisting of pedicels; perianth funnel-shaped, up to 6 mm diam, mustard-coloured, joined to ovary by a pseudo-pedicel about 1 mm long, 0.5 mm diam, segments equal, joined at base for about one-fifth of length, about 3 mm long, about 1 mm broad, oblong, upper part spreading, apex obtuse, incurved, upper surface glabrous with concave median line, under-surface with minute tubercles which also occur on outside of perianth tube; stamens rudimentary, white, about 0.5 mm long, anthers nodular; style lower part erect, cylindrical, up to 2 mm long, upper part three-branched, branches at right angles to main axis, about 0.5 mm long upper surface channeled, apex deflexed, bi-lobed, acute; ovary inferior, about 7 mm long, 1.5 mm diam, trilocular, three-angled, longitudinally ribbed, yellowish-green, with very fine tubercles visible with × 20 magnification.

Fruit. Pedicels elongating to about 7 mm, bearing capsule erect, capsule dry, three winged, up to 2 cm long, 1.8 cm broad at top, narrowing at base, flattened capsule very broadly obovate to nearly cylindrical, glabrous, light-brown with darker diagonal markings, dehiscing in upper third, ripe April-October.

Seeds one to two in each loculus, flat, circular, about 5 mm diam, wing distal, light brown, membranous, about 10 mm long, 7 mm broad.

Habitat. Growing at altitudes from 500 to 4,000 ft, on rocky slopes with eastern aspect in dry soils derived from quartzite of the Cape system or from shales of the Karoo system. Occurring in thorny and succulent karroid bush with *Carissa ferox*, *Gymnosporia spp.*, *Rhus spp.*, *Aloe supp.*, *Crassula spp. and* variety of geophytes.

Distribution. The earliest records seem to be those of Thunberg and Masson who together reached the Sundays River (in the Uitenhage Division) on 16th December, 1773. According to Burkill there are two specimens of *D. elephantipes* in Thunberg's herbarium and the receipt of Masson's specimens at Kew was recorded by Aiton as 1774. L'Heriter saw the Kew specimens in 1788, probably

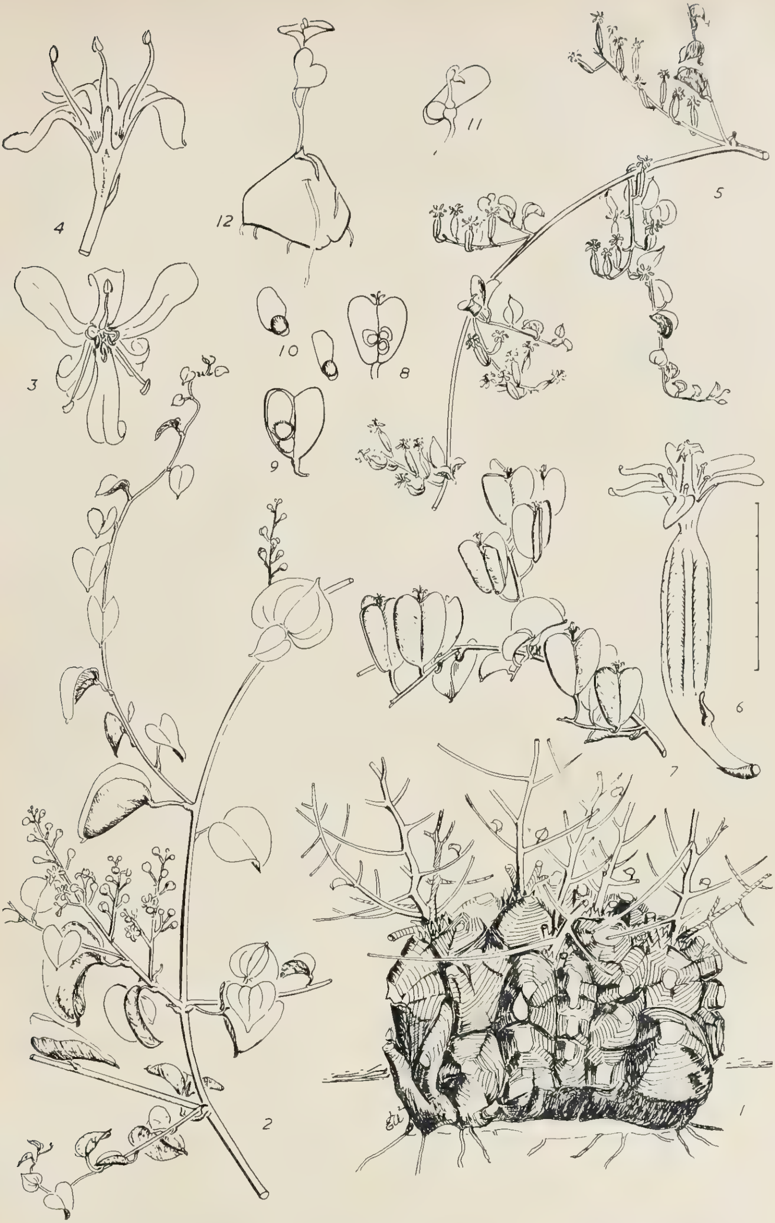


FIG. 12.

D. elephantipes. 1 Adult tuber; Male plant: 2 inflorescence. 3, 4 flower in surface and sectional views; Female plant: 5 inflorescences, 6 flower; 7 shoot bearing capsules; 8 developing seed; 9 ripe capsule; 10 ripe seed; 11 seedling; 12 juvenile plant. (11 and 12 after Sparshott, reproduced with permission from J. Linn. Soc., Bot., 49, 1935). Scale = 18 cm fig. 1; scale = 50 mm fig. 2, 5, 7—10; scale = 25 mm fig. 11, 12; scale = 6 mm fig. 6; scale = 5 mm fig. 3, 4.

also the specimen sent by David Nelson from the Cape in 1776. Burkill suggests that Nelson's specimen was obtained from Auge the Company's Gardener at Cape Town, who was well known to Thunberg and Masson and had accompanied Thunberg as guide on his first expedition to the eastern part of the country in 1772. James Niven who went to the Cape in 1798 and stayed until 1812 sent further tubers to Europe one of which, a female plant with a tuber one foot in diameter, flowered under the care of a horticulturist Joseph Knight. This plant was figured in the Botanic Magazine pl. 1347.

D. elephantipes is becoming increasingly rare in South Africa. Not only is it a horticultural curiosity but it is liable to destruction by angora goats which are now being bred in quantity in the Karoo veld. In the division of Albany in particular it is now very scarce. For example it was recorded over a period of five years from 1892 onwards on the farm Brakkloof by Mrs G. White, whose specimens of shoots are in the Albany Museum Herbarium. It was also known from several other farms in the district, but of recent years no specimens in these areas have been located in spite of enquiry and investigation.

Cape Province: Clanwilliam Division, between Clanwilliam and Boschkloof, Meyer s.n., Aasvogelberg, Meyer s.n., Clanwilliam, Marloth 27151 (not seen); Graaff-Reinet Division, Mountains S.W. of Graaff-Reinet, Burchell 2913 (K), Mt. at Graaff-Reinet, Drège 8560c (K), Bowker 3 (K), hillside on farm nr. Rietvlei, Galpin 9971 (NH), Brandkraal, Kendrew coll. B. Hobson, Archibald 8014 (AM, N, K, B); Somerset East Division, Boschberg, MacOwan 1214 (K, HAMK); Pearston Division, valley 3 m west of Vogelriver, P. O. Acocks 12012 (N); Willowmore Division, mt. west of Miller Station coll. Andreae, Marloth 1002 (N); Albany Division, Brakkloof Farm, Mrs. G. White 484 Feb. 1892 (AM), Mrs. G. White s.n. May 1896 (AM), no name or no. Feb. 1908 (AM); Uitenhage Division, Ecklon 788 (K), Zwartkops Hills, Sundays River, Zeyher 583 (K, HMAK), Hoffman's Kloof between Enon and Zuurberg, Drège 8561 (K), Sundays River, Ecklon and Zeyher 34·3 (AM), between Karoo Bush on Sundays River, Ecklon and Zeyher (N ex Berlin Herb. 1936), ex Addo cult. Karoo Gardens, Whitehills, Compton 29096 (N), s.n. 3/41, 6/42, 2/43 (Comp. Herb. NBG); Humansdorp Division, Gamtoos River, Keeling 11732 (N), Patensie, Basson s.n. (in cult. RU). Without locality coll. I. H. Bowker, photo. only 21542 Herb. Mus. Afr. Kirstenbosch.

Dioscorea hemicrypta, Burkill Journ. Lin. Soc. (Bot.) 53, 377 (1949); Journ. S. A. Bot. 18, 189 (1952); *Testudinaria glauca* Marloth in Herb. Fig. 13.

Plants dioecious, leafy shoots dying back annually and being renewed from the crown.

Tuber perennial, partially epigeal, presumably of hypocotylar origin (cf. *D. elephantipes*); seedlings not seen; in adult plants base subterranean (one-third to a half of the whole), up to 60 cm across, concave, periphery irregular deeply lobed, outer surface corky, finely and irregularly reticulate, with numerous sparsely branched roots; upper part exposed above ground, total height up to about 45 cm, surface greyish-brown, with numerous tortoise-like plates, irregularly 4—6-sided, up to 3 cm across, up to 2 cm thick, increasing by formation from growing point or by splitting of old plate, with irregular lines of peripheral growth from central umbo, corky, hard; inner flesh hard, brittle, off-white; crown of several growing points at top of tuber, somewhat immersed or slightly conical, natural growth or injury may cause separation of crown into two or more parts, growing points marked by a few persistent, deltoid bracts. Tubers injured by predators or by tramping of grazing animals.

Stems solitary or several, growth dependent on rains, generally starting in December or early January, sometimes as late as March, shoots remain green for 8—12 months, later drying and forming a mass of rigid branches assisting support of new season's growth, when protected by surrounding bush lax, climbing freely, sinistrorse, reaching a height of 2 metres, otherwise in exposed situations with short, erect, rigid stem about 30 cm long, up to 15 mm diam at base, dark olive-green, glabrous, tapering, freely branched; lateral branches more or less at *right angles*, yellowish-green, glaucous, forming rigid spines after leaf fall.

Leaves exstipulate, alternate, bifacial, glabrous, deciduous; lower pulvinus forming well developed, persistent leaf base on main stem and first laterals, otherwise lower and upper pulvinus inconspicuous, scarcely distinguished by thickness from petiole; petiole 2—6 mm long, about 0·5 mm thick, glabrous, spreading or erect; lamina with sides folding upwards about mid-vein, closing together in drought, 5—7-veined, broadly ovate obtuse, up to 32 × 26 mm, or very broadly ovate emarginate, up to 38 × 38 mm, base slightly cordate with obtuse sinus, pale yellowish-green, conspicuously glaucous in older foliage, with yellowish accretions showing on herbarium specimens, veins slightly more prominent on lower surface, apex mucronate, mucro deltoid, up to 2 mm long.

Male Flowers. Inflorescences present in January but dependent on rains, solitary, simple or compound, rachis erect, pale yellowish-green, glaucous, up to 13 cm long; flowers numerous, erect or spreading; pedicels up to 5 mm long; bract and bracteole 1 mm or less, deltoid, finely acuminate, separated from each other by length of pedicel; buds turbinate, pale glaucous-green above, dark olive- or brownish-green below; perianth funnel-shaped, shallow, 6—7 mm diam; segments joined at base for less than a quarter of length, mustard-green, equal, 3 mm long, about 1 mm wide, oblong, obtuse, decurved, three inner with incurved apex; stamens six, filaments joined to lip of perianth, about half length of segments, incurved, anthers basifixed, introrse, about 0·5 mm long, pollen yellow; style rudimentary, conical, tri-partite, about 0·5 mm long,

Female Flowers. Inflorescences solitary, simple or sparingly branched. generally horizontal, angular, up to 12 cm long, later becoming hard and thorny; flowers up to 30 in number, erect; pedicels up to 5 mm long, about 1 mm thick, brownish-green, bract and bracteole about 1 mm long, deltoid, acute, the upper near base of ovary; buds oval; perianth rotate, mustard-coloured, about 6 mm diam, joined to ovary by a pseudopedicel about 0·5 mm long, 1 mm diam; segments about 3 mm long, 1 mm broad, joined in lower sixth to form a shallow funnel, upper parts spreading, outer elliptical, inner oblong with incurved apex, obtuse; stamens six rudimentary, filaments less than 0·5 mm long, joined to lip of perianth, erect, anthers nodular; style cylindrical, erect, about 1 mm long, 0·5 mm thick, style branches three, at right angles to style, less than 1 mm long, flattened vertically, apex bi-lobed, not deflexed, obtuse, with papillate margins; ovary inferior, 6—7 mm long, about 2 mm diam, olive-green, trilocular, sharply three-angled, glabrous.

Fruit. Erect, capsule dry, three-winged, up to 22 mm long, 16 mm broad, very broadly obovate, narrowing at base, glabrous, light creamish-brown with glaucous surface, dehiscing in upper third, ripe October–November.

Seeds. One to two in each loculus, flat, circular, about 5 mm diam, wing distal, light-brown, membranous, about 10 mm long, 7 mm broad.

Habitat. Growing on lower southern and south-eastern slopes of deep dry valleys, at altitudes of 1,000—2,500 ft, on loose scree slopes formed of decomposing shale and quartzitic rocks. Associated with *Portulaccaria afra*, *Rhus spp,. Gymnosporia spp.*, *Aloe mitriformis* and *Crassula spp.* and always in shelter of rocks or, more commonly, bushes.

Distribution. CAPE PROVINCE: Van Rhynsdorp Division, in mountains Langerberg, Marloth (K); Ladismith Division, nr. Ladismith, Marloth 3990 (K), Huis River Pass, Lewis 4018 (NBGK). Compton 4667, 8577, 7734 (NBGK). Thorns 21/2/39 (NBGK), Bond 24/3/40 (NBGK), Heginbotham 213 (NBGK), Wilson photo 117, 123, 100 (N), Marloth 12132 (N), Archibald 7589, 7590, 8010 (AM, K, N, B); Prince Albert Division, Prince Albert, Marloth 12731, Krige (B 12967); Oudtshoorn Division, Cango Caves, Marloth 12738, Watkins s.n., Compton 10746 (NBGK), Archer 413 (NBGK), Wilson photo. 93, 95 (N), Marloth 12132 (N), nr. Kamanassie Dam, Lewis 4551 (HMAK), Schoeman's Poort, L. Britten 1629 (AM), Bankhooghte, van Breda Nov. 57 (N).

ACKNOWLEDGEMENTS

An appeal for material of and information about some imperfectly known species of Dioscorea circulated by Mr E. Milne-Readhead of the Royal Botanic

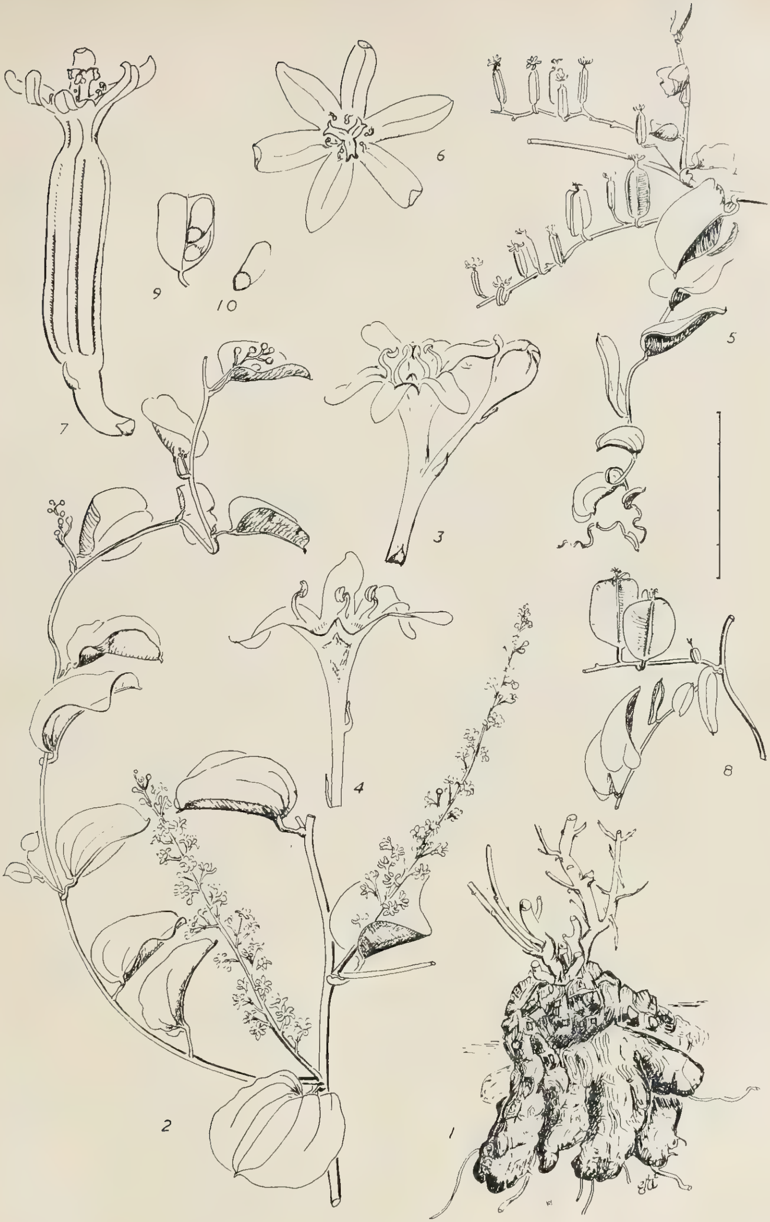


FIG. 13.

D. hemicrypta. 1 Young adult tuber; Male plant: 2 inflorescences, 3, 4 flowers in side and sectional views; Female plant; 5 inflorescences, 6, 7 flower in surface and side views; 8 shoot bearing capsules; 9 capsule sectional view; 10 seed. Scale = 15 cm fig. 1; scale = 50 mm fig. 2, 5, 8, 9, 10; scale = 6 mm fig. 7; scale = 5 mm fig. 3, 4, 6.

Gardens, Kew, caused me to look more closely at the "local" species of *Dioscorea* and has resulted in the foregoing thoughts, descriptions and illustrations. I am most grateful to Mr Milne-Readhead for suggesting that my observations should be published independently and also for his co-operation in supplying information. I also wish to express my gratitude to the Director, Royal Botanic Gardens, Kew, for permission to dissect type material and to publish drawings thereof, and to the Council of the Linnean Society of London for permission to reproduce from the Society's Journal.

The publication of the plates accompanying this paper has been made possible by a grant from the Council of Scientific and Industrial Research. It is also a pleasure to acknowledge the assistance given by Rhodes University and the loan of herbarium specimens from the institutions listed below. Assistance in collecting and in gaining access to private property has been given by Miss Grace Britten, Mrs. L. F. Lloyd, Mr. Barney Nimmo, Mr. Jackson, Mr. and Mrs. C. Bennie, Mr. and Mrs. F. Bowker and Col R. Bayliss. Dr. I. B. Pole Evans has allowed me to use one of his photographs. A patient husband has on many occasions successfully extracted a difficult tuber.

Abbreviations used for Herbaria

AM—Albany Museum Herbarium, Grahamstown.
B—Bolus Herbarium, University of Cape Town.
HAMK—Herbarium of South African Museum, Kirstenbosch.
K—Royal Botanic Gardens, Kew.
NBGK—Herbarium of National Botanic Gardens, Kirstenbosch.
N—National Herbarium, Pretoria.
RU—Botany Department Herbarium, Rhodes University.

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A. V. DUTHIE EN HAAR BYDRAE TOT DIE PLANTKUNDE*

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Abstract

Augusta Vera Duthie (18th July, 1881 to 8th August, 1963) was the founder of the Department of Botany in the University of Stellenbosch. She received her botanical training in the Huguenot College, Wellington (South Africa), under the guidance of Dr. Bertha Stoneman and started as lecturer in Stellenbosch in April 1902. She was, presumably, the first South African trained botanist to be appointed as University lecturer in the country. She was Head of the Department until February 1921 and retired as Senior Lecturer in December 1939. She started lecturing in Stellenbosch under very difficult conditions but managed to lay sound foundations for botanical teaching and research. Her publications on the flora and vegetation of Stellenbosch are valuable contributions to Botany.

Wanneer 'n mens die geskiedenis bestudeer, word jy getref deur die besondere bydraes en rigtinggewende invloed van bepaalde persone wat jou bewondering en eerbied afdwing.

In die geskiedenis van die Plantkunde-departement van die Universiteit van Stellenbosch was dr. A. V. Duthie so 'n persoon. Sy was as die eerste dosent in Plantkunde aan die eertydse Victoria-Kollege die stigter van die Departement Plantkunde. Sy is, sover aan my bekend, die eerste plantkundige wat, na opleiding in Suid-Afrika, as dosent aan 'n Suid-Afrikaanse Universitêre inrigting aangestel is.

Dr. Duthie is al 'n paar jaar terug oorlede, maar daar is nog geen bespreking oor haar bydrae tot die Plantkunde in 'n wetenskaplike tydskrif gepubliseer nie. Met die hulp van dr. M. P. de Vos wil skrywer graag hierdie leemte in hierdie Eeufeesjaar van die Universiteit aanvul. Kort beriggies oor haar het wel verskyn, o.a. in *Eikestadnuus* op 16 Augustus 1963 en in *Matieland* en in die *Nuusbrief van die Suid-Afrikaanse Akademie* in Desember 1963.

Volgens die *Calendar of Victoria College and Boys' High School, Stellenbosch*, 1903 (bl. 33) het die Raad van die Victoria-Kollege vroeg in 1902 besluit om

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* Voordrag gelewer op 1 Junie 1966 voor die Tak Biologie (Stellenbosch) van die Suid-Afrikaanse Akademie vir Wetenskap en Kuns.

'n dosent in Plantkunde aan te stel. Die Victoria-Kollege het onder die Universiteit van die Kaap die Goeie Hoop geressorteer en die Universiteit het enkele jare tevore besluit om eksamens in Plantkunde vir graaddoeleindes af te neem. Die Hugenote Kollege, Wellington wat die eerste inrigting was om Plantkunde as vak vir die graad B.A. aan te bied (Phillips, 1930), het teen 1902 al gegradueerde studente met Plantkunde as hoofvak gelewer. Ongetwyfeld het professor Rudolf Marloth ook direk of indirek bygedra tot die Raad se belangrike besluit. Professor Marloth was 'n invloedryke plantkundige en het verskeie jare tevore al begin om Plantkunde in die Landbouskool te Stellenbosch aan te bied. Hy was ook een van die Universiteit van die Kaap die Goeie Hoop se eksaminatore in Plantkunde.

Die eerste dosent wat die Raad aangestel het, was die twintigjarige A. V. Duthie wat so pas die graad B.A. aan die Hugenote Kollege verwerf het. Die Raad moes goeie verslae oor die jonge Duthie van haar dosent, dr. Bertha Stoneman, en ander wat haar geken het, ontvang het om hierdie gewigtige besluit te neem.

LEWENSLOOP

Die vader van A. V. Duthie was luitenant Archibald Henry Duthie van Belvidere, Knysna. In 1868 is hy in Engeland met Augusta Vera Roberts getroud (Hart, A. en R., 1934). Hulle het drie seuns en twee dogters gehad. Augusta Vera is op 18 Julie 1881 op Belvidere gebore.

Die jonge Augusta het in Belvidere op die mooi ou familieplaas in die huis langs die Knysnameer opgegroei. In 1899 gaan sy na die Hugenote Kollege in Wellington, studeer daar Plantekunde, Fisika en Matesis (Duthie, 1940) en verwerf in 1901 die graad B.A. van die Universiteit van die Kaap die Goeie Hoop. Die volgende jaar, op 1 April, aanvaar sy die betrekking as dosent in Plantkunde aan die Victoria-Kollege. Sy studeer as privaatstudent en na sy Deel I en Deel II van die graad M.A., onderskeidelik in 1909 en 1910, geslaag het, word die graad M.A. in Plantkunde in Desember 1910 deur die Universiteit van die Kaap die Goeie Hoop aan haar toegeken (Registrateur Univ. S. Afr., brief 25/4/1966). In 1912 was sy met verlof en bring die jaar in Cambridge deur. In 1920 gaan sy weer na die buiteland maar hierdie keer na Australië. Later bied sy van haar navorsingsresultate aan as 'n doktorstesis en in 1929 ken die Universiteit van Suid-Afrika aan haar die graad D.Sc. toe op grond van die proefskrif *Vegetation and Flora of the Stellenbosch Flats*. Op 31 Desember 1939 tree sy as senior lektrise uit die diens van die Plantkunde-departement maar, omdat sy nog verlof tot haar beskikking het, bly sy op die diensstaat van die Universiteit tot 31 Augustus 1940. Die res van haar lewe bring sy op Belvidere deur waar sy op 8 Augustus 1963 oorlede is en waar sy in die familiekerkhof langs die historiese Normandiese kerkie begrawe is.

DRIE PERIODES

Die werk van dr. Duthie op Stellenbosch kan in drie periodes ingedeel word t.w. 1902–1912, 1913–1920 en 1921–1939.

1902–1912.

Toe mej. Duthie in April 1902 hier kom, het 'n klas vir haar gewag want studente het by die begin van die jaar ingeskrywe en 'n mej. Walker het hul besig gehou tot mej. Duthie opdaag. Die Departement het een vertrek in die

PLATE I.
A. V. Duthie (1881-1963)

noordelike vleuel van die ou Hoofgebou op Kollege-Plein tot sy beskikking gehad, maar verder niks nie—geen laboratoria, geen apparaat, geen mikroskope, geen versamelings, geen boeke, geen toelaag vir apparaat of boeke, geen kweekhuis of tuin en geen laboratorium- of tegniese assistente nie.

In die Stellenbossche Oudstudent van April 1940 vertel dr. Duthie iets van die moeilike beginjare van die departement. Sy het nie kans gesien om met die R100 per jaar wat die Raad haar aangebied het, die betrekking hier te aanvaar nie. Die owerhede het egter met Bloemhof gereël dat sy daar vry kon loseer. Vir hierdie ,,vry" verblyf en losies moes sy egter in Bloemhof toesig hou en daar sekere klasse in Plantkunde, Engels, Suid-Afrikaanse Geskiedenis, Godsdiens en Spraakkuns waarneem! Gelukkig is haar salaris later opgeskuif na R300 per jaar en kon sy die werk in Bloemhof laat vaar.

Teen die einde van 1902 rapporteer die Senaat van die Victoria-Kollege dat ,,the Senate considers that the College is to be congratulated on securing the services of so able and enthusiastic a teacher as Miss A. V. Duthie, B.A." Terselfdertyd rapporteer die Raad dat ,,arrangements made during the past year for the teaching of Botany have proved satisfactory; but it is felt that fuller provision should be made in this direction, and the matter has been taken in hand by the Council".

Klein toelaes vir die biblioteek en benodigdhede is deur die Raad aan die departement toegeken. Die biblioteektoelae was egter so klein dat 'n goeie plantkundige tydskrif nie daaruit bekostig kon word nie. Die benodigdhedetoelaag was egter sodanig dat 'n paar mikroskope aangekoop kon word.

'n Aangeleentheid wat die jong mej. Duthie onmiddellik aandag aan gegee het, was die opbou van 'n herbarium. 'n Aansporing in hierdie verband was 'n prys van R10 wat die Onderwysdepartement uitgeloof het vir die inrigting wat die beste versameling van 'n paar honderd gemonteerde plante, met name, voorlê. Vir drie agtereenvolgende jare het die jong Plantkunde-departement van die Victoria-Kollege die prys gewen. Die eksemplare het die kern van die herbarium gevorm en met die verowerde pryse kon boeke aangekoop word. In die kalender van 1903 word al melding gemaak van die herbarium en in die kalender van 1904 kom die volgende voor: ,,The equipment at present consists of ten compound microscopes, a microtome and five hundred specimens, which, it is hoped, will form the nucleus of an extensive and representative herbarium of the flora of the Cape".

Teen 1908 kry mej. Duthie deeltydse hulp in die persoon van mnr. J. W. Maxfield wat ook in die Dierkunde-departement behulpsaam was. Op 1 Januarie 1912 kom 'n tweede lektoraat tot stand en S. J. Garside word in die pos aangestel. Die periode 1902–1912 loop ten einde met mej. Duthie se terugkeer van Cambridge.

1913–1920.

Met 1913 begin bepaald 'n nuwe fase in die lewe en werk van mej. Duthie en in die geskiedenis van die Plantkunde-departement. Mej. Duthie het kort vantevore die graad M.A. behaal, is pas terug van studie oorsee en beskik nou oor die hulp van 'n voltydse en goed opgeleide lektor. Hierdie lektor, Sidney Garside, het die graad M.Sc. in Plantkunde in Manchester behaal en word, volgens Bolus en Jessop (1962), o.m. verantwoordelik gestel vir die doseer van plantfisiologie. Die periode 1913–1920 is 'n periode van aktiewe uitbouing en opbouing van die departement.

In hierdie periode kry die departement huisvesting in die Gebou vir Natuurwetenskappe wat in 1916 ingewy is. Die westelike helfte van die eerste verdieping wat deur die Plantkunde-departement betrek is, is deur mej. Duthie, met die hulp van mnr. Garside, beplan. Op aandrang van mej. Duthie is in die nuwe gebou voorsiening gemaak vir lokale vir 'n herbarium en 'n museum. Met die hulp van mnr. Garside bou sy die museum op tot een van die grootste plantkunde-museums in die land. In die nuwe gebou het die departement ook sy eerste eksperimentele laboratorium gekry.

In hierdie tyd beskik die departement ook oor 'n kweekhuis en 'n „tuin" op Kollege-Plein. Presies wanneer hierdie „tuin" tot stand gekom het en die kweekhuis opgerig is, is nie vasgestel nie. Die „tuin" het heel waarskynlik al voor 1913 tot stand gekom. In hierdie tyd beskik die departement ook al oor 'n laboratorium-assistent en in 1919 word aansoek om 'n tweede gedoen.

In hierdie periode word die Victoria-Kollege die Universiteit van Stellenbosch en die Plantkunde-departement 'n selfstandige departement wat nie meer gebonde is aan die leerplanne en die eksamens van die Universiteit van Kaap die Goeie Hoop nie.

In 1919 doen mej. Duthie om gesondheidsredes aansoek om 'n jaar verlof en bring die jaar 1920 in Australië deur. Sy het heelwat materiaal vir die museum en die herbarium uit Australië saamgebring.

1921–1939.

In Februarie 1921 tree mnr. Garside uit die diens van die Universiteit en word 'n professoraat in Plantkunde geskep. Teen die verwagtings van mej. Duthie se intieme vriende word sy nie in die professoraat aangestel nie. Die Raad se keuse het geval op dr. G. C. Nel wat op 1 Maart 1921 diens aanvaar het. Op 28 Februarie 1921 loop mej. Duthie se hoofskap van die departement dus ten einde en is sy voortaan 'n gewone dosent.

Met die koms van professor Nel word mej. Duthie se administratiewe drag verlig en haar doseerdrag meer gespesialiseerd. Professor Nel is voortaan verantwoordelik vir plantfisiologie en vir die anatomie en sistematiek van die saadplante. Hy kry prof. P. A. van der Byl van die Stellenbosch-Elsenburg Landboukollege om Swamkunde in die departement te doseer. Mej. Duthie se hoof verantwoordelikheid is voortaan die morfologie van die outotrofe Cryptogamae en die tweedejaarsklas. Professor Nel neem die administrasie van die Algemene Herbarium waar, maar mej. Duthie bly in bevel van die Stellenboschse distriksherbarium wat sy opbou tot een van die grootste distriksherbaria in die land.

In hierdie tyd neem die aantal eerstejaars vinnig toe en kan die departement nie al die studente huisves nie. In 1929 kry die departemente Dierkunde en Plantkunde huisvesting vir hul eerstejaars in die Annexe. Amper dertig jaar later, in 1957, het die departement eers weer verdere akkommodasie bygekry en toe vir die eerste maal spesiale huisvesting vir nagraadse studente bekom.

LEERPLANNE EN KURSUSSE

Van die begin af het die Plantkunde-departement voorsiening gemaak vir die sogenaamde *Intermediate-*, *Pass-* en *Honours*-kursusse vir die graad B.A. Die *Intermediate* was die eerstejaarskursus en die *Pass* die tweede- en derdejaarskursus. Die honneurskursus kon ook in drie jaar voltooi word, maar vir B.A.-honneurs moes 'n diepergaande studie van sekere aspekte van die *Pass*-leerplan gemaak word.

Die leerplanne vir hierdie kursusse is tot 1917 voorgeskryf deur die Universiteit van die Kaap die Goeie Hoop. Die oudste leerplan vir die „Pass"-kursus wat in die *Calendar of Victoria College and Boys' High School, Stellenbosch* genoem word, behels die volgende: *Morphology. Anatomy and Histology. Physiology. Systematic Botany. Practical work.* Die oudste leerplan vir die honneurskursus bevat die volgende: *Advanced study of morphological, anatomical and histological botany. Outlines of the geographical distribution of plants. Historical development of our knowledge of the nutrition and assimilation of plants. Practical work.* Die *Pass*-leerplanne is algaande meer breedvoerig uiteengesit. Die honneursleerplan het min verander en selfs na die aanstelling van Garside word plantfisiologie nie aangebied nie.

Met die totstandkoming van die Universiteit in 1918 het die plantkundeleerplanne aanvanklik nie verander nie. Dit is eers in 1921 met die koms van professor Nel en die herindeling van die werk, heeltemal herformuleer.

Mej. Duthie het ook later begin om vir spesiale kursusse voorsiening te maak. So bestaan daar in 1918 'n kursus vir 'n Diploma in Landbou. Later is daar ook 'n Natuurstudiekursus vir studente wat H.P.O.D. en Diploma in Huishoudkunde volg. Die Plantkunde-deel van hierdie Natuurstudiekursus, of Biologiekursus soos dit ook soms genoem is, is deur dr. Duthie tot haar aftrede waargeneem.

Die eerste voorgeskrewe boeke vir Plantkunde was Lowson se *Textbook of Botany*, Strasburger se *Textbook of Botany* en Edmond en Marloth se *Elementary Botany for South Africa.* Nuwe uitgawes van eersgenoemde twee boeke is vandag nog op die mark en Strasburger se boek word vandag nog deur baie beskou as die beste plantkundige handboek. Die boek van Edmond wat deur Rudolf Marloth vir Suid-Afrikaanse skole verwerk is, was vir 'n lang ruk die enigste boek waarin die plantkunde deur Suid-Afrikaanse voorbeelde geïllustreer is, en was, soos ook die herbarium wat sy dadelik begin opbou het, onontbeerlik om die Plantkunde 'n Suid-Afrikaanse kleur te gee.

Dr. Duthie het haar klasse deur medium Engels gegee. Aangesien haar studente vrae soms in Afrikaans beantwoord het, moes sy haar tog vergewis van die Afrikaanse plantkundige vakterme. In hierdie verband het professor J. H. Neethling vir haar en mnr. Garside gehelp.

NAVORSING

In die beginjare van die departement het mej. Duthie min geleentheid vir navorsing gehad. Haar eerste publikasie—oor die anatomie van *Gnetum africanum*—verskyn in 1912. Na 1921 het sy meer geleenthede vir navorsing en die meeste van haar publikasies verskyn ook na hierdie datum (kyk Bylae).

Mej. Duthie het haar toegespits op 'n studie van die plantsoorte en plantegroei in haar omgewing. Deur dit te doen het sy nie alleenlik die kennis van die plaaslike plantegroei en flora uitgebrei nie, maar sy het ook belangrike bydraes gemaak tot die internasionale Plantkunde. Haar publikasies het internasionale erkenning gekry en is en word dikwels in internasionale publikasies genoem.

Sy was 'n toegewyde en deeglike navorser. Ek verwys in hierdie verband net na haar studie van die plantegroei en flora van die vlakte om Stellenbosch.

Vir die studie van die flora van die Stellenboschvlakte het sy baie tyd op die vlakte deurgebring, en daar klein perseeltjies vir gereelde en deeglike waarneming afgesteek. Om die soorte nog deegliker te leer ken het sy grond van die vlakte na die departement gebring. Hier het sy die grond in bakke natgehou en elke plantjie deeglik bestudeer. So het sy talle plantsoorte „ontdek" wat sy voorheen nog nie op die vlakte waargeneem het nie. So het sy ook geleer om die soorte in hul verskillende ontwikkelingstadia vanaf die kiemplantstadium in die veld uit te ken. Haar intensiewe studie van die vlakte het as gevolg gehad dat die Stellenboschvlakte plantkundig die bes bestudeerde area in die land, miskien die bes bestudeerde area in die wêreld, geword het.

Skrywer hiervan is baie beïndruk deur haar studie van en publikasies oor die Mycetozoa (Myxomycetes, slymswamme)—'n groep organismes wat in die vegetatiewe fase „dierlik" en in die voortplantingsfase „plantaardig" is en waarvan voorbeelde selde gesien word. Tog het mej. Duthie 'n uitstekende versameling hiervan opgebou—'n versameling waarvan 'n gedeelte vandag nog in die Plantkunde-museum gehuisves word.

In die genera wat dr. Duthie intensief bestudeer het, het sy verskeie nuwe plantsoorte ontdek en beskrywe. Op die Stellenboschvlakte is 13 van hierdie soorte t.w. vyf soorte van *Urginea*, drie soorte van *Isoetes*, twee soorte van *Eriospermum* en een elk van *Anthericum*, *Chlorophytum* en *Riccia*. Verskeie plantsoorte is na haar vernoem. Twee hiervan kom op die vlakte voor t.w. *Restio duthieae* en *Romulea duthieae* wat onderskeidelik deur N. S. Pillans en H. M. L. Bolus beskrywe is. Mevr. Bolus het ook *Psilocaulon duthieae*, *Ruschia duthieae*, *Stomatium duthieae* en *Impatiens duthieae* na haar vernoem.

STUDENTE

In die 38 jaar ('n rekord vir lengte van diens in die Plantkunde-departement) wat dr. Duthie aan die Plantkunde-departement verbonde was, het talle studente by haar klasse gevolg. Drie van haar oudstudente van voor 1918 wat later 'n belangrike rol in die plantkundige vakke op Stellenbosch gespeel het, is G. C. Nel, P. A. van der Byl en I. de V. Malherbe.

Die klasregisters van voor 1918 is nog nie opgespoor nie. Die oudste klasregister (dié van 1918) wat ter insae was, bevat die name van 42 eerstejaars (o.a. dié van J. J. Buhr), sewe tweedejaars en derdejaars wat dieselfde klasse gevolg het, een 01 (T1)-student en vyf studente wat die Diploma in Landbou gevolg het. Een van die tweedejaarstudente was mnr. G. C. Theron wat later ingeskrywe het vir die M.Sc. in Plantkunde. Die bekendste name kom voor in die Landboulys en ek noem die volledige lys: S. J. Botha, H. J. Malan, P. O. Sauer, C. T. van der Merwe, J. S. van der Spuy.

Later het die klasse heelwat groter geword en het daar jaarliks 'n groter getal studente by haar klasse gevolg. Die tweedejaarsklas wat haar hoof verantwoordelikheid was, was nooit groot nie. Haar grootste tweedejaarsklas, t.w. 15, het sy in 1939, in haar laaste diensjaar, gehad.

KOLLEGAS.

Omdat die personeel min gewissel het, het dr. Duthie in haar dienstyd min kollegas gehad. Op die vaste doserende personeel van die departement was daar net drie, t.w. mnr. S. Garside (1912–1920), prof. G. C. Nel (1921–1939) en dr. E. I. Markötter (1927–1939). As plaasvervangers was P. G. Jordaan (1935–1937) en M. P. de Vos (1937) vir kort tydjies saam met haar op die personeel.

In 1912 was 'n sekere mnr. W. C. Worsdell en in 1920 mej. Gertrude Torrance haar plaasvervangers. Mej. Torrance wat haar B.A. in Kaapstad behaal het, is later getroud met die bekende plantkundige van Cambridge, H. Hamshaw Thomas.

DR. DUTHIE AS MENS

Om op twintigjarige leeftyd die taak aan te pak om 'n nuwe departement op te bou, vereis besondere hoedanighede van hart en verstand—van kennis, ondernemingsgees en deursettingsvermoë. Mej. Duthie was 'n knap student wat haar werk nie net geken het nie, maar ook 'n groot liefde vir die natuur gehad het en 'n behae gevind het in kennis en begrip van plante. Haar werk was vir haar 'n plesier en sy het 'n toegewyde student gebly.

Dr. Duthie was 'n saggeaarde, fynbeskaafde en godsdienstige persoon wat altyd baie simpatiek in haar optrede was. Tog was sy ferm en beslis en regverdig. Sy was 'n beminlike persoon vir wie die studente hoë agting gehad het. Sy het selde, indien ooit, moeilikheid met dissipline in die klasse gehad. Dit word vertel dat toe prof. Nel by geleentheid vir haar versoek het om studente wat hulle nie in haar klasse gedra nie, by hom aan te meld, sy geantwoord het dat sy dit nie by hom sal aanmeld nie, maar dat sy onmiddellik sal bedank as sy dissiplinêre moeilikheid in haar klas sou ondervind (A. C. Wessels, mededeling).

Sy was 'n knap leermeester en as sy iets verduidelik het, het die studente dit verstaan. Daarby was sy 'n inspirerende dosent en talle studente sal kan getuige dat sy by hulle 'n liefde vir die natuur, die Biologie en die Plantkunde aangewakker het.

Dr. Duthie het 'n wye vriendekring onder plantkundiges in die land en in die buiteland gehad. Ek verwys net na 'n paar wat vir haar en vir die Plantkunde-departement van besondere betekenis was. Eerstens, dr. Bertha Stoneman, haar leermeester, wat haar nie net met 'n liefde vir Plantkunde geïnspireer het nie, maar by wie sy ook geleer het hoe om 'n departement te organiseer. Tweedens, mevr. H. M. L. Bolus, kuratrise van die Bolus Herbarium, 'n lewenslange vriendin, met wie dr. Duthie hartlik saamgewerk het en sonder wie se hulp en inspirasie dr. Duthie seker nooit die versamelings op Stellenbosch kon opgebou en die plante benaam het nie.

Dr. Duthie se broers is betreklik vroeg dood. Haar laaste oorblywende broer, William, is in 1933 oorlede en daarna het die verantwoordelikheid van die bestuur van die plaas op Belvidere op haar skouers gerus. Dit was ook 'n belangrike rede waarom sy betreklik vroeg uit die diens van die Universiteit getree het. Na haar aftrede kom haar plantkundige aktiwiteite tot stilstand.

Met haar aftrede het sy haar belangrike briofieteversameling aan die Bolusherbarium geskenk. Haar plantkundige literatuur het sy aan die Universiteit van Stellenbosch geskenk wat na haar dood ook haar versameling Knysnaplante ontvang het.

Ongeveer 2·6 hektaar (6·5 akker) van die Stellenboschvlakte is deur die Universiteit as 'n klein veldreservaat aan die Plantkunde-departement toegeken.

Ter verering van dr. Duthie vir wie die vlakte haar belangrikste „laboratorium" was, word dit die Duthiereservaat genoem.

BRONNE

Afgesien van die publikasies vermeld in die literatuurverwysings, is van die volgende bronne gebruik gemaak:—

1. Calendars of the University of the Cape of Good Hope.
2. Calendars of the Victoria College and Boys' High School, Stellenbosch.
   In elke *Calendar* of Jaarboek is o.m. jaarverslae van die Raad en Senaat.
3. Jaarboeke van die Universiteit van Stellenbosch.
4. Raadsnotules van die Universiteit van Stellenbosch.
5. Senaatsnotules van die Universiteit van Stellenbosch.
6. Klasregisters van die Departement Plantkunde van die Universiteit van Stellenbosch.
   Die registers tot 1918 het vermoedelik verlore gegaan.
7. Korrespondensie tussen dr. Duthie en die Universiteit van Stellenbosch soos bewaar in die Universiteitslêers.
   Die korrespondensie tot 1918 kon nie gevind word nie.
8. Briewe van dr. Duthie aan dr. H. M. L. Bolus.
9. Korrespondensie tussen dr. Duthie (na haar aftrede) en die Departement Plantkunde van die Universiteit van Stellenbosch.

Sover is nog weinig briewe wat dr. Duthie geskryf het terwyl sy op Stellenbosch was, opgespoor.

Verskeie persone wat dr. Duthie geken het, het op een of ander wyse inligting verskaf. Ek noem hier net die volgende:—

dr. H. M. L. Bolus, mevr. C. M. Bosman, mej. M. E. Cameron, G. C. Crafford, dr. M. P. de Vos, wyle mnr. S. J. Garside, dr. C. S. Grobbelaar, H. Herre, H. J. Malan, H. Meyer, mevr. J. T. Morrison, prof. J. H. Neethling, wyle prof. G. C. Nel, mevr. G. Hamshaw Thomas, A. C. Wessels.

FOTO'S

Foto's van dr. Duthie en van haar klasse is uiters skaars. Foto's wat van dr. Duthie en lede van haar klas op die Stellenboschvlakte geneem is, is verkry van dre. K. L. J. Blommaert en N. J. van der Merwe (beide lede van die Botanie II-klas van 1937).

DANKBETUIGINGS

Graag wil ek die persone en instansies wat een of ander wyse behulpsaam was, bedank vir hul hulp. In besonder wil ek dr. M. P. de Vos bedank vir die opstel van die lys van publikasies van dr. Duthie en vir mnre. R. B. van der Merwe en I. Kruger wat gehelp het om sommige van die bronne te deursoek.

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